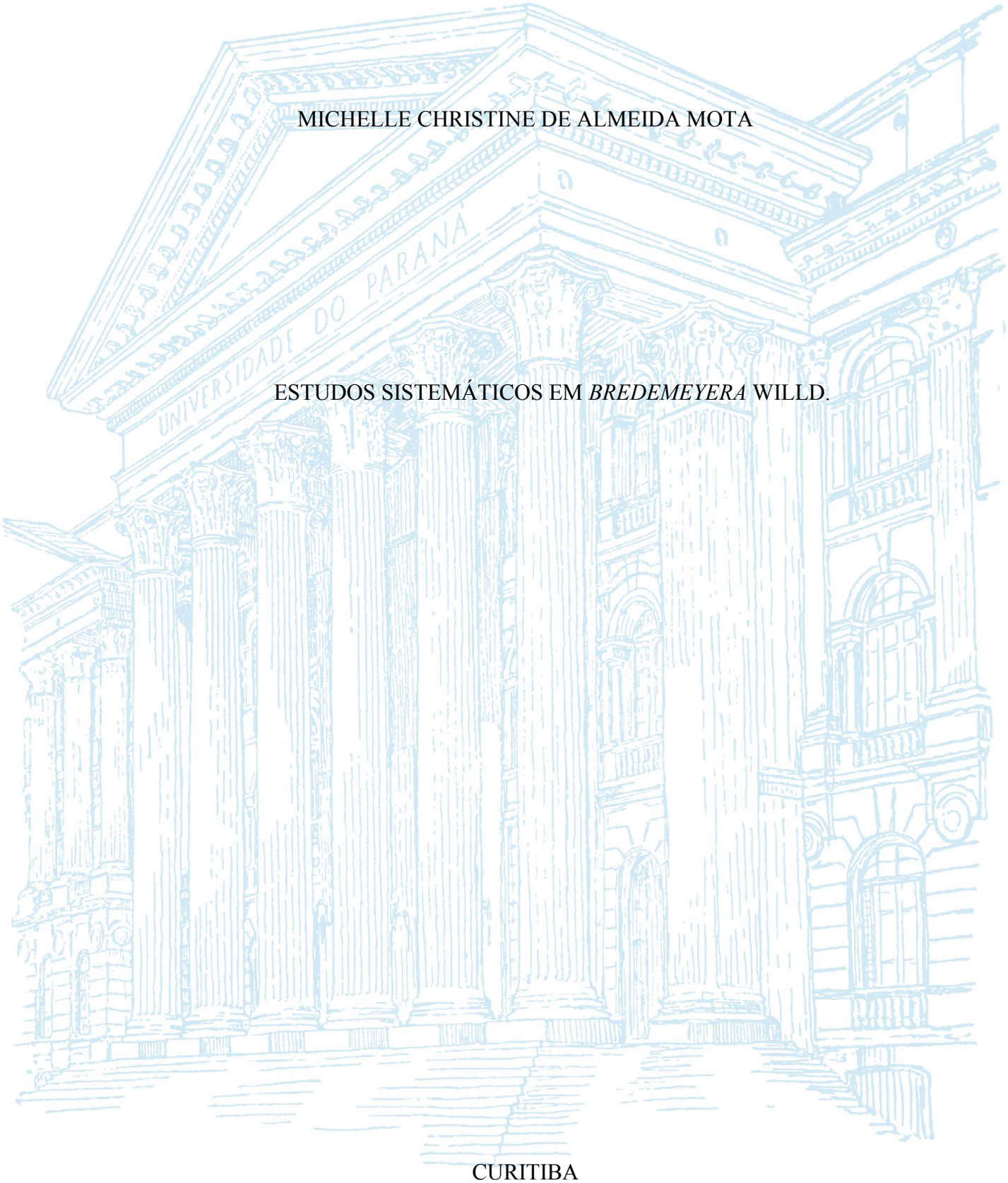
UNIVERSIDADE FEDERAL DO PARANÁ

MICHELLE CHRISTINE DE ALMEIDA MOTA



ESTUDOS SISTEMÁTICOS EM *BREDEMEYERA* WILLD.

CURITIBA

2018

MICHELLE CHRISTINE DE ALMEIDA MOTA

ESTUDOS SISTEMÁTICOS EM *BREDEMEYERA* WILLD.

Dissertação apresentada como requisito parcial à obtenção do grau de mestre, pelo Curso de Pós-Graduação em Botânica do Setor de Ciências Biológicas, Universidade Federal do Paraná.

Orientador: Prof. Dr. José Floriano Barêa Pastore
Coorientador: Prof. Dr. Renato Goldenberg

CURITIBA

2018

Universidade Federal do Paraná. Sistema de Bibliotecas.
Biblioteca de Ciências Biológicas.
(Giana Mara Seniski Silva – CRB/9 1406)

Mota, Michelle Christine de Almeida
Estudos sistemáticos em *Bredemeyera* Willd. / Michelle Christine de Almeida Mota. – Curitiba, 2018.
133 p.: il.

Orientador: José Floriano Barêa Pastore
Coorientador: Renato Goldenberg

Dissertação (mestrado) - Universidade Federal do Paraná, Setor de Ciências Biológicas. Programa de Pós-Graduação em Botânica.

1. Botânica - Classificação 2. Taxonomia vegetal 3. Vegetação – Classificação I. Título II. Pastore, José Floriano Barêa III. Goldenberg, Renato, 1968- IV. Universidade Federal do Paraná. Setor de Ciências Biológicas. Programa de Pós-Graduação em Botânica.

CDD (20. ed.) 583.74

UNIVERSIDADE FEDERAL DO PARANÁ

Setor de Ciências Biológicas
Programa de Pós-Graduação em Botânica

UFPR Biológicas

Estudos sistemáticos em *Bredemeyera* Willd

por

Michelle Christine de Almeida Mota

Dissertação aprovada como requisito parcial para obtenção do grau de Mestre no Programa de Pós-Graduação em Botânica, pela Comissão formada pelos doutores

José Floriano Barêa Pastore

Eric de Camargo Smidt

Leonardo Maurici Borges

Curitiba, 10 de agosto de 2018.

AGRADECIMENTOS

Às agências de fomento CNPQ/CAPES pelas bolsas que viabilizaram essa dissertação.

Ao meu orientador e amigo José Floriano B. Pastore, pela dedicação, disposição e ensinamentos, principalmente às ótimas discussões sobre nomenclatura botânica.

Ao meu coorientador Renato Goldenberg pela atenção e solicitude.

À Ana Maria Giullietti-Harley e Raymond M. Harley pelo grande apoio para as coletas na Bahia.

À Dra. Marla Ibrahim curadora do herbário ASE, que auxiliou no envio de materiais.

Aos amigos Javier e Mariela Florentin pela ajuda para as coletas e pelas facturas e doce de leite argentinos (menos pelo Fernet), que nos abasteceu na Argentina.

Ao Dr. Roberto M. Salas pelas coletas na Argentina, que além de apoio logístico, contou também com muitas risadas.

À Dr. Ana Maria Gonzalez do Instituto IBONE pela ajuda no processamento do material coletado na Argentina.

À Dra. Gloria Barbosa e demais pesquisadores do herbário CORD que nos recebeu e auxiliou na análise dos espécimes neste herbário.

Às equipes dos herbários visitados CEN, CTBS, CTES, HUEFS, MBM, MBML, R, RB, UB, UPCB pelo auxílio na análise dos espécimes.

Ao Lucas Marinho e Karina pela ajuda com envio de materiais importantes.

Ao seu Everaldo Pastore pelo apoio logístico nas coletas pela Chapada dos Veadeiros.

Aos professores da PPG de botânica da UFPR, em especial à Dr. Viviane Pereira Silva pelas dicas no início do mestrado e ao Dr. Eric de Camargo Smidt pelas correções dos relatórios parciais, que contou com ótimas dicas.

Aos amigos (que não citarei pelos nomes para não esquecer ninguém)

Aos meus pais pelo incentivo na carreira acadêmica.

À Nina (em lembrança), minha eterna companheira canina.

RESUMO

Bredemeyera Willd. é um dos 27 gêneros da família Polygalaceae (ca. de 1.200 espécies). O gênero *Bredemeyera s.str.*, como aqui delimitado, é reconhecido com 13 espécies e distribuição neotropical, desde o México até o nordeste do Paraguai. Este gênero ocorre em todas as regiões do Brasil, exceto no extremo sul do país, ou seja, nos Estados de Santa Catarina e Rio Grande do Sul. O gênero é aqui reconhecido pelas seguintes características morfológicas: lianas lenhosas a pequenos arbustos, com flores com cinco sépalas, sendo três externas e duas internas petalóides; a corola é formada por 5 pétalas duas laterais, a carena, e duas pelas rudimentares; os frutos são cápsulas loculicidas e a sementes apresentam um arilo pequeno do qual partem longos tricomas que ultrapassam o comprimento da própria semente. Esta dissertação é apresentada em três capítulos: o primeiro é uma revisão taxonômica do gênero *Bredemeyera s.str.*, o segundo capítulo apresenta duas novas espécies, *B. atlantica* M.Mota & J.F.B.Pastore e *B. petiolata* M.Mota & J.F.B.Pastore (artigo publicado em 2018 na revista *Phytotaxa*) e por fim, o terceiro capítulo, que trata da delimitação do gênero *Bredemeyera*, incluindo a segregação do gênero monotípico *Ramphopetalum* J.F.B.Pastore & Mota e o reestabelecimento dos gêneros *Hualania* Phil. e *Monrosia* Grondona (em processo de revisão na revista *Taxon*).

Palavras chave: Neotrópicos, sistemática, Fabales, filogenia molecular, espécie nova.

ABSTRACT

Bredemeyera Willd. is one of the 27 genera in the family Polygalaceae (ca. 1,200 species). The genus *Bredemeyera* s.str., as delimited here, is recognized with 13 species and neotropical distribution, from Mexico to northeast Paraguay. This genus occurs in all regions of Brazil, except the extreme south, in the states of Santa Catarina and Rio Grande do Sul. This genus is here recognized by the following morphological features: woody lianas to small shrubs, flowers with five sepals, being three external and two internal, petaloid (wings); the corolla has five petals, being two lateral, the keel, and two rudimentary ones; the fruits are loculicidal capsules with small aryled seed, and the aryl has long trichomes, which are longer than the seed itself. The present thesis comprises three chapters: 1. Taxonomic revision of the genus *Bredemeyera* s.str.; 2. Two new species, *B. atlantica* M.Mota & J.F.B.Pastore and *B. petiolata* M.Mota & J.F.B.Pastore (article published in 2018 in Phytotaxa); 3. Generic delimitation of *Bredemeyera*, including the segregation of the monotypic genus *Ramphopetalum* J.F.B.Pastore & Mota and the reestablishment of the genera *Hualania* Phil. and *Monrosia* Grondona (under review in *Taxon*).

Key words: Neotropical, systematic, Fabales, molecular phylogeny, new species.

LISTA DE FIGURAS

Figura 1. A. Cladograma e **B.** Filograma, baseado em sequências de DNA plastidial (*matK* + *trnL–F* + *rbcL*) para os gêneros de Polygalaceae. Fonte: *Pastore et al.* 2017.....13

CAPÍTULO 1

Figura 1. A–D. *Bredemeyera floribunda* Willd.; E. *B. barbeyana* Chodat; F e G. *Bredemeyera hebeclada* (DC.) J.F.B.Pastore; H. *B. divaricata* (DC.) J.F.B.Pastore; I-K. *B. brevifolia* (Benth.) Klotzsch *ex* A.W.Benn. (Photos by. A, F, G, I–K. Michelle Mota & Floriano Pastore; B–D. Henrique Moreira; H. Marcelo Simon).....22

Figura 2. Species richness map of *Bredemeyera* Willd., in grid cell of of 2º × 2º.....……..23

Figura 3. *Bredemeyera atlantica* M.Mota & J.F.B.Pastore. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule (A. *A.M. Assis & M.D.S. Demuner 1992* (RB); B–H. *L. Krieger s.n.* (CTBS) e J. *L.C. Giordano et al. 2384* (CTBS)).....26

Figura 4. Distribuition map of *Bredemeyera atlantica* M.Mota & J.F.B.Pastore, *Bredemeyera barbeyana* Chodat, *Bredemeyera bracteata* Klotzsch *ex* Hassk. and *Bredemeyera brevifolia* (Benth.) A.W.Benn…….....27

Figura 5. *Bredemeyera barbeyana* Chodat. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium; J. Capsule. (A. *S.B. da Silva & R.P. Orlandi 388* (MBM); B–H. *M. Mota & J.F.B. Pastore 125* (CTBS); J. *G. Hatschbach & O. Guimarães 42290* (CTBS)).....30

Figura 6. *Bredemeyera bracteata* Klotzsch *ex* Hassk. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule (A. *D.C. Daly 8903* (RB) e B–H. *Pessoal do CPF s.n.* (RB)).....33

Figura 7. *Bredemeyera brevifolia* (Benth.) A.W.Benn. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium; J. Capsule. (A. *M.L. Guedes et al. 24221* (ALCB); B-J. *G. Hatschbach et al. 78405* (CTBS))……....36

Figura 8. *Bredemeyera cuneata* Klozsch ex Hassk. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium; J. Capsule (*R.H. Schomburgk & M.R. Schomburgk 504/803* (NY))…….4
0

Figura 9. Distribuition map of *Bredemeyera cuneata* Klozsch ex Hassk., *Bredemeyera divaricata* (DC.) J.F.B.Pastore, *Bredemeyera floribunda* Willd. and *Bredemeyera hebeclada* (DC.) J.F.B.Pastore.....41

Figura 10. *Bredemeyera divaricata* (DC.) J.F.B.Pastore. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule (A. *H.S. Irwin et al. 16885* (CEN). B–H. *L.M. Borges et al. 771* (RB) e J. *R.M. Becker 101* (RB)…….....…45

Figura 11. Morphological variation in *Bredemeyera divaricata* (DC.) J.F.B.Pastore…..…..47
Figura 12. *Bredemeyera floribunda* Willd. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule. A. *M.R. Pietrobom da Silva s.n.* (CTBS); B–H. *T.B. Croat 21352* (MBM) e J. *V. Demuner et al. 3000* (CTBS).....52

Figura 13. *Bredemeyera hebeclada* (DC.) J.F.B.Pastore. Habit. B, B'e B". Bract and bracteoles. C, C' e C". External sepals. D e D'. Internal sepals. E. Keel. F e F'. Lateral petals. G. Androecium. H. Gynoecium. J. Capsule (A. *F.H.F. Nascimento 445*. B–H. *J.H.C Ribeiro 107* CTBS. J. *M.L.M. Azevedo e E.C. Lopes 318* HUEFS).....62
Figura 14. *Bredemeyera laurifolia* (A.St.-Hil. & Moq.) Klotzsch *ex* A.W.Benn. A. Habit. B, B'e B". Bract and bracteoles. C, C' e C". External sepals. D e D'. Internal sepals. E. Keel. F e F'. Lateral petals. G. Androecium. H. Gynoecium. J. Capsule (A. *H.C. de Lima 4625* RB. B–H. *L. Kollman 10295* MBM. J. *R. Guedes et al. 2251* RB)…….....…...67

Figura 15. Distribuition map of *Bredemeyera laurifolia* (A.St.-Hil. & Moq.) Klotzsch *ex* A.W.Benn., *Bredemeyera martiana* A.W.Benn., *Bredemeyera myrtifolia* A.W.Benn., *Bredemeyera pastoreana* and *Bredemeyera petiolata* M.Mota & J.F.B.Pastore…...….68

Figura 16. *Bredemeyera martiana* A.W.Benn. A. Habit. B, B'e B". Bract and bracteoles. C, C' e C". External sepals. D e D'. Internal sepals. E. Keel. F e F'. Lateral petals. G. Androecium. H. Gynoecium. J. Capsule (A. *R.P. Oliveira et al. 404*. B–J. *G. Hatschbach et al. 77944* CTBS).....71

Figura 17. *Bredemeyera myrtifolia* A.W.Benn. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule. A. *A.H. Medeiros 1482*; B–H. *C.A. Cid Ferreira et al. 243* (RB) e J. *C.A.A. Freitas et al. 02* (MBM).....75

Figura 18. *Bredemeyera pastoreana*. A. Habit. B, B'e B". Bract and bracteoles. C, C' e C". External sepals. D e D'. Internal sepals. E. Keel. F e F'. Lateral petals. G. Androecium. H. Gynoecium. J. Capsule (*L.P. Félix 7939* RB).....78

Figura 19. *Bredemeyera petiolata* M.Mota & J.F.B.Pastore. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule. A-J. *A.P. Prata et al. 1977* (CTBS).....80

CAPÍTULO 2

Figura 1. Habit of *Bredemeyera atlantica* M.Mota & J.F.B.Pastore and *B. petiolata* M.Mota & J.F.B.Pastore. **A.** *Bredemeyera atlantica* (*A.M. Assis & M.D.S. Demuner 1992,* CTBS) and **B.** *Bredemeyera petiolata* (*A.P. Prata et al. 1977*, CTBS).....93

Figura 2. Comparison of floral details of *B. atlantica* M.Mota & J.F.B.Pastore and allies and *B. petiolata* M.Mota & J.F.B.Pastore with *B. barbeyana* Chodat. *Bredemeyera hebeclada* (DC.) J.F.B.Pastore (*T.A.C. Lima s.n.*) and *B. atlantica* (*A.M. Assis 199*).....95

Figura 3. Distribution map of *B. atlantica* and *B. petiolata*…….....97

CAPÍTULO 3

Figura 1. Distribution map of *Hualania colletioides* Phil., *Monrosia pterolopha* (Chodat) Grondona and *Ramphopetalum microphyllum* (Griseb.) J.F.B.Pastore & M.Mota.....105

Figura 2. A Majority-rule consensus tree from the Bayesian analysis of the combined nuclear (ITS) and plastid (*matK* + *trnL-F* + *rbcL*) datasets for Polygalaceae. Numbers above branches are posterior probabilities (in percentages), with PP=100 for branches……108

Figura 3. Trees from majority-rule consensus tree from the Bayesian analysis of the nuclear (ITS) (left) and plastid (*matK* + *trnL-F* + *rbcL*) (right) datasets for Polygalaceae. Numbers above branches are posterior probabilities (in percentages), with PP=10……...110

Figura 4. *Hualania colletioides* Phil. **A.** Stem with inflorescence; **B** and **C.** Flowers, side view; **D** and **E.** External sepals; **F.** Internal sepal (wing); **G.** Keel, lateral view; **H.** Androecium and lateral petals; **I.** Rudimentary petal; **J.** Gynoecium; **L.** Detail of anthers; **M.** Capsule and **N.** Seed. (*J.F.B. Pastore & al. 5301* CTBS)…….....…117

Figura 5. A--D, *Rhamphopetalum microphyllum*. A. & B., Habit; C., Fruit; D., Flower. E.—H., *Hualania colletioides.* E., Habit; F., Inflorescence; G., Fruits; H., Leaves in early branch. (B. Photos by J.F.B. Pastore; A. & C.--D. Photos by Roberto Salas)….....118

Figura 6. *Monrosia pterolopha*. A. Raceme; B., B'. Bract and Bracteole; C. Flower, side view; D., D'. Lower external sepals in front and back views; E. Upper external sepal, front view; F., F'. Wing (internal sepal) in front and back views; G., G' Keel, lateral view; G., G'. Androecium and lateral petals in front and lateral views; I. Gynoecium (*G.E. Barbosa 4260* CORD).....120

Figura 7. *Rhamphopetalum microphyllum*. A. Stem with inflorescence; B. Flower; C. Bract; C'. Bracteole; D. Upper external sepal; E. Lower external sepal; F. Wing (internal sepal); G. Keel, lateral view; G'. Keel, front view; H. Androecium; H'. Androecium and lateral petals; J. Capsule; K. Seed. (*M.C.A. Mota & al. 122*).…….....123

LISTA DE TABELAS

CAPÍTULO 1

Tabela 1: Morphological comparative table of *Bredemeyera pastoreana* M.Mota e *B. barbeyana* Chodat.....79

CAPÍTULO 3

Tabela 1: Species number in the Polygalaceae genera and species sampled……..…..…100

Tabela 2: Morphological character states of some representative species of the genera belonging to Polygalaceae…….…..….107

SUMÁRIO

INTRODUÇÃO GERAL.....11
REFERÊNCIAS.....16
CAPÍTULO 1. Taxonomic revision of *Bredemeyera* Willd. (Polygalaceae).....18
CAPÍTULO 2. Two new species of *Bredemeyera* (Polygalaceae) from Brazil….....89
CAPÍTULO 3. Three lonely Argentines: Toward a new generic delimitation in Polygalaceae……..……99
CONSIDERAÇÕES FINAIS……..……132
REFERÊNCIAS........133

ESSA DISSERTAÇÃO **NÃO** CONSTITUI PUBLICAÇÃO EFETIVA PARA OS NOMES E TIPIFICAÇÕES AQUI UTILIZADOS. ESTAS MUDANÇAS SERÃO EFETIVAS SOMENTE A PARTIR DA PUBLICAÇÃO EM PERIÓDICOS CIENTÍFICOS INDEXADOS.

INTRODUÇÃO GERAL

Polygalaceae possui 27 gêneros e cerca de 1.200 espécies (Pastore et al. 2017), distribuídas por quase toda a superfície terrestre, exceto por certas regiões desérticas ou gélidas do planeta. A família é considerada monofilética e pertence à ordem Fabales (APG IV 2016). Possui quatro tribos, *Carpolobieae* B.Eriksen, *Diclidanthereae* Reveal, *Xanthophylleae* Baill. e *Polygaleae* Chodat (Eriksen & Persson 2007, Reveal et al. 2012), a última apresentando flores que lembram as flores papilionáceas das leguminosas (entretanto, em Polygalaceae a carena é formada por uma única pétala e as alas são sépalas petalóides; Pastore 2006).

O gênero *Bredemeyera* foi descrito em 1801 por Willdenow para homenagear seu amigo Franz Bredemeyer, que coletou em Caracas (Venezuela), o tipo da única espécie incluída originalmente no gênero, *B. floribunda* Willd. (Willdenow 1801). A delimitação do gênero não foi prontamente reconhecida por outros botânicos contemporâneos e, desta forma, as primeiras espécies de *Bredemeyera* foram descritas em outros gêneros como *Securidaca* (*S. hebeclada* DC.), *Badiera* (*B. divaricata* DC.) e *Polygala* (*P. disperma* Vell.). Saint Hilaire (1828a, b) sinonimizou *Bredemeyera* em *Comesperma* Labill., ampliando a delimitação deste para incluir espécies Sul Americanas. O mesmo autordescreveu três novas espécies de *Comesperma* para o Brasil e combinou a espécie tipo de *Bredemeyera* em *Comesperma*, *C. floribunda* (Willd.) A.St.-Hil. & Moq.; desde então, *Bredemeyera* teve sua delimitação confundida com o gênero *Comesperma*.

Aparentemente sem conhecimento do nome *Bredemeyera*, e sem aceitar a relação das espécies brasileiras e australianas, Bentham (1842) criou o gênero *Catocoma* Benth., para o qual descreveu novas espécies e transferiu todas as espécies brasileiras de *Comesperma* de Saint-Hilaire, incluindo *Comesperma floribunda*. Posteriormente, Bentham (1851) comentou a delimitação de *Bredemeyera*, sugerida por Klotzsch por meio do 'nome' *Bredemeyera bracteata* Klotzsch (naquele momento não validamente publicado por Klotzsch, sendo assim um *nomem nudum*). Nesta nota, foi indicado que as diferenças entre *Bredemeyera* e *Catocoma* estariam no fruto, citando que Willdenow descreveu *Bredemeyera* como "drupa ovata nuce biloculari", e a compara com *Catocoma,* descrita por ele com frutos capsulares. Hasskarl (1864) utilizou o nome *Bredemeyera* ao invés de *Catocoma* e descreveu alguns nomes de herbário de Klotzsch como *B. moritziana* Klotzsch *ex* Hassk. e *B. bracteata* Klotzsch *ex* Hassk

.

Dentre os estudos mais significativos sobre o gênero está a Flora brasiliensis (Bennett 1874) que, além de apresentar novas espécies, incluiu combinações em *Bredemeyera,* deixando-o com uma circunscrição próxima à atual.

Van Steenis (1968) recuperou a ideia de que *Comesperma* e *Bredemeyera* estariam melhores sob um mesmo gênero, mas ao contrário dos outros autores, este se utiliza do nome mais antigo, *Bredemeyera* (1801 *vs.* *Comesperma* de 1806). Desta forma, este último autor apresentou diversas novas combinações das espécies de *Comesperma* em *Bredemeyera* (veja em "Táxons excluídos"), além de descrever uma nova espécie para a Papua Nova Guiné, *Bredemeyera papuana* Steen. Posteriormente, Pedley (1984) novamente tratou *Bredemeyera* e *Comesperma* como gêneros independentes em seu estudo sobre *Comesperma* para o estado de Queensland, Austrália, e, apesar de comentar que *B. papuana* estaria melhor agrupada no gênero *Comesperma,* o autor não a agrupou neste gênero. As semelhanças morfológicas que incitaram equivocadamente a união dos gêneros são principalmente os longos tricomas nas sementes e as cápsulas longas obovais. No entanto, estudos filogenéticos baseados em marcadores moleculares evidenciam a distinção dos dois gêneros (Pastore 2017), já que *Comesperma* e *Bredemeyera* emergem seguramente em clados relativamente distantes (Fig. 1). Além de filogeneticamente distantes, estes gêneros são também morfologicamente distintos e com áreas de ocorrência diferentes. Enquanto *Bredemeyera* é restrita à região neotropical, *Comesperma* se restringe à Oceania. Morfologicamente, os dois gêneros são distintos pelo halo das sementes de onde saem os longos tricomas e pelo tipo de inflorescência. Em *Bredemeyera*, o halo nas sementes se forma apenas no seu ápice, e as inflorescências são compostas (panículas), enquanto que em *Comesperma* o halo apresenta em todo o corpo da semente, e as inflorescências são rácemos simples.

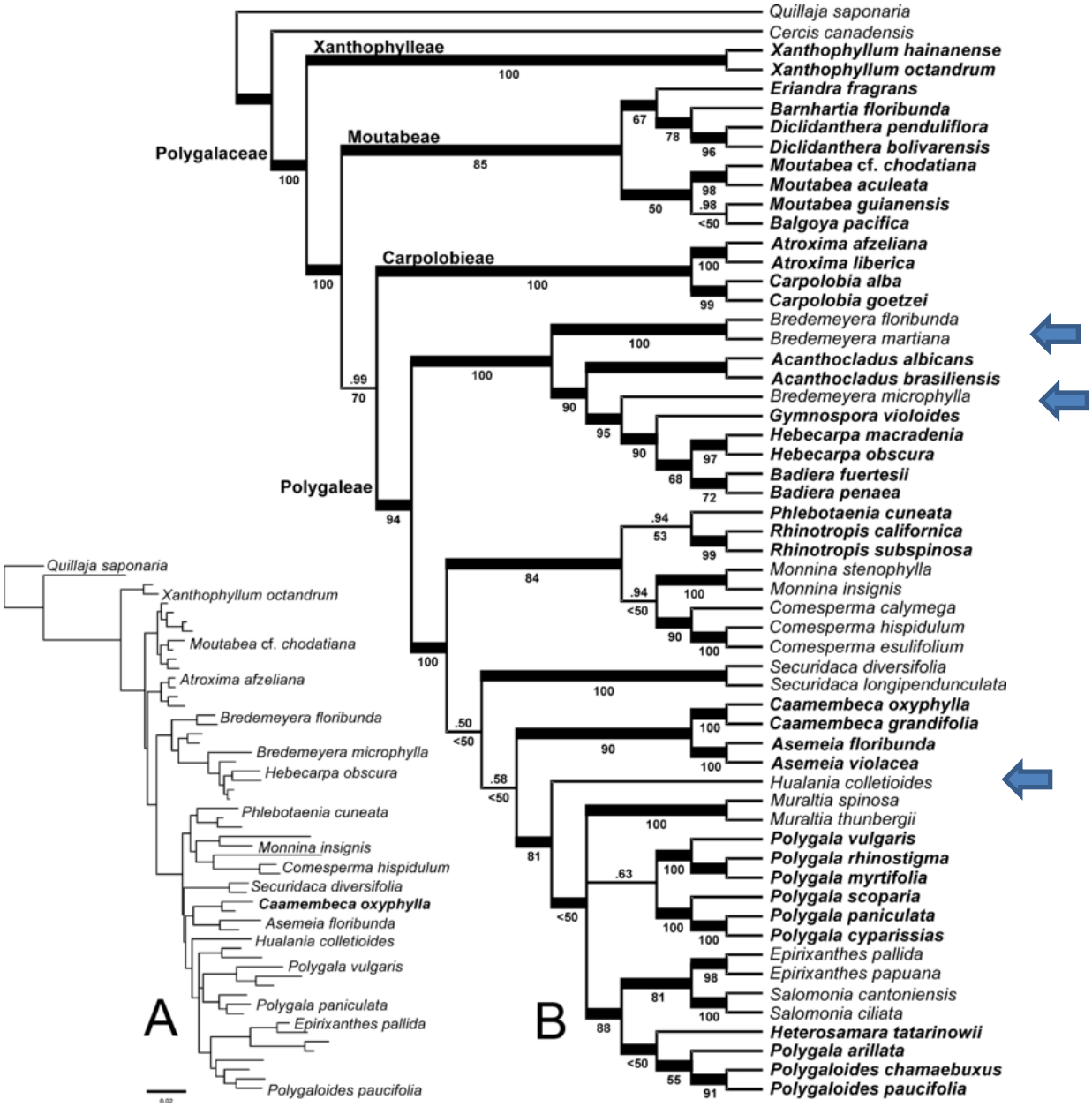


Figura 1. Hipótese das relações filogenéticas entre os gêneros de Polygalaceae. Cladograma (A) e filograma (B), baseado em sequências de DNA plastidial (*matK* + *trnL-F* + *rbcL*). Fonte: Pastore et al. (2017). Membros de *Bredemeyera s.l.* são apontados na figura.

Após Marques (1980), que apresentou um estudo taxonômico para as espécies brasileiras de *Bredemeyera,* a taxonomia de *Bredemeyera* foi abordada apenas em artigos pontuais como Pastore (2010, 2014a, 2014b), nos quais foram propostas respectivamente três novas combinações no gênero, *Bredemeyera hebeclada* (DC.) J.F.B.Pastore, *B. divaricata* (DC.) J.F.B.Pastore e *B. disperma* (Vell.) J.F.B.Pastore.

Nas últimas décadas foram feitas diversas alterações nas delimitações genéricas em Polygalaceae, principalmente naqueles gêneros que anteriormente eram tratados como

categorias infragenéricas de *Polygala* L., tais como *Acanthocladus* Klotzsch *ex* Hassk. (Pastore et al. 2010), *Asemeia* Raf. (Pastore & Abbott 2012), *Caamembeca* J.F.B.Pastore (Pastore 2012), *Gymnospora* (Chodat) J.F.B.Pastore (Pastore & Moraes 2013) e *Hebecarpa* (Chodat) J.R.Abbott. Mesmo com as citadas modificações nas delimitações genéricas, alguns gêneros em Polygalaceae permaneceram com delimitação elusiva, como *Moutabea* Aubl., *Polygala* L. e *Bredemeyera* Willd.

Até o presente estudo *Bredemeyera* Willd. incluía 14 espécies, ocorrendo desde o México até a Argentina, se destacando dos demais gêneros da família, por serem plantas neotropicais e por apresentar sementes com longos tricomas. Esta delimitação, entretanto, já era considerada parafilética deste a primeira ampla filogenia de Polygalaceae apresentada por Persson (2001). Neste estudo foi demonstrado que as espécies argentinas *Bredemeyera colletioides* (Phil.) Chodat e *B. microphylla* (Griseb.) Hieron, não formavam um grupo monofilético com as demais espécies de *Bredemeyera* amostradas (Persson 2001, Pastore et al., 2017).

Esta dissertação é dividida em três capítulos. O primeiro capítulo apresenta uma caracterização morfológica do gênero *Bredemeyera* e suas espécies, chave taxonômica, tipificação dos nomes envolvidos, distribuição geográfica, status de conservação, ilustrações para todas as espécies, além de uma espécie nova, *B. pastoreana* M.Mota, e a elevação de *Bredemeyera* sect. *Melchiora* ao status genérico, com a nova combinação *M. papuana*. No segundo capítulo foram descritas duas novas espécies, *B. atlantica* M.Mota & J.F.B.Pastore e *B. petiolata* M.Mota & J.F.B.Pastore. Por fim, no terceiro capítulo é apresentado um estudo filogenético baseado nas regiões plastidiais *matK, rbcL* e *trnL-F,* incluindo implicações taxonômicas, tais quais a segregação do gênero monotípico *Ramphopetalum* J.F.B.Pastore & M.Mota e o reestabelecimento dos gêneros *Hualania* Phil. e *Monrosia* Grondona.

REFERÊNCIAS

APG IV. 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181: 1–20.

Bennett, A. W. 1874. Polygaleae. Pp. 1–82 in *Flora Brasiliensis*, vol. 13, part. 3, eds. C. F. P. Martius, A. W. Eichler and I. Urban. Leipzig: Friedrich Fleischer.

Bentham, G. 1842. Polygalaceae. Contributions towards a Flora of South America. Enumeration of plants collected by Mr. Schomburgk, in British Guiana. *Journal of Botany* v: 99–133.

Bentham, G. 1851. Second report on Mr. Spruce's collections of dried plants from North Brazil. *Journal of Botany and Kew Garden Miscellany* 3: 161–166.

Eriksen, B. and C. Persson. 2007. Polygalaceae. Pp. 345–363 in *The families and genera of vascular plants*, vol. 9, ed. K. Kubitzki. Berlim: Springer-Verlag.

Hasskarl, I. C. 1864. Polygalaceae, praesertim indicae, in: *Annales Musei botanici lugduno-batavi* 1: 142–196.

Marques, M. C. M. 1980. Revisão das espécies do gênero *Bredemeyera* Willd. (Polygalaceae) do Brasil. *Rodriguésia* 32: 269–321.

Mota, M. & J. F. B. Pastore. 2018. Two new species of *Bredemeyera* (Polygalaceae) from Brazil. *Phytotaxa* 351(2),: 171–175.

Pastore, J. F. B. 2006. *Polygalaceae Hoffmannsegg & Link No Distrito Federal, Brasil*. Dissertação de Mestrado, Universidade De Brasília, Distrito Federal.

Pastore, J. F. B. 2010. *Bredemeyera hebeclada* a new combination in Polygalaceae. *Novon* 20: 314–316.

Pastore, J. F. B. 2012. *Caamembeca:* Generic Status and New Name For *Polygala* Subgenus *Ligustrina* (Polygalaceae). *Kew Bulletin* 67: 435–442.

Pastore, J. F. B. & Abbott, J. R. 2012. Taxonomic Notes and New Combinations for *Asemeia* (*Polygalaceae*). *Kew Bulletin* 67: 801–813.

Pastore, J. F. B. & Moraes, P. L. R. 2013. Generic status and lectotypifications for *Gymnospora* (Polygalaceae). *Novon* 22: 304–306.

Pastore, J. F. B. 2014a. *Bredemeyera divaricata*, a new combination for the well-known Amazonian species of Polygalaceae. *Phytotaxa* 175: 59–60.

Pastore, J. F. B. 2014b. Saint-Hilaire's Polygalaceae. *Phytotaxa* 158: 201–223.

Pastore, J. F. B., J. R. Abbott, K. M. Neubig, M. W. Whitten, R. B. Mascarenhas, M. C. A. Mota, C. V. D. & Berg. 2017. A Molecular Phylogeny and Taxonomic Notes in *Caamembeca* (Polygalaceae). *Systematic Botany* 42: 54–62.

Pedley, L. 1984. A revision of Comesperma (Polygalaceae) in Queensland. *Austrobaileya* 2(1): 7–14.

Persson, C. 2001. Phylogenetic relationships in Polygalaceae based on plastidial DNA Sequences from *the trnL-F* region. *Taxon* 50(3): 763–779.

Reveal, J.L. 2012. Newly required infrafamilial names mandated by changes in the Code of Nomenclature for Algae, Fungi and Plants. Phytoneuron 33: 1–32.

Saint-Hilaire, A. F. C. P. & C. B. A. Moquin-Tandon. 1828a. *Conspectus Polygacearum Brasilie Meridionalis. Annales De La Société Des Sciences, Belles-Lettres Et Arts D'orléans* 9: 44–59.

Saint-Hilaire, A. F. C. P. & C. B. A. Moquin-Tandon. 1828b. Premier Mémoire Sur La Famille Des Polygalées. *Mémoires Du Museum D'histoire Naturelle* 17: 313–375.

van Steenis, C. G. G. J. 1968. Notes On *Bredemeyera* (*Comesperma*) With A New Papuan Species And The Australian Species Listed (Polygalaceae). *Plant Biology* 17: 377–384.

Willdenow, C. L. 1801. Drei Neue Pflanzen-Gattungen. *Der Gesellschaft Naturforschender Freunde zu Berlin* 3: 403–412.

CAPÍTULO 1. Taxonomic revision of *Bredemeyera* Willd. (Polygalaceae)

Este capítulo está formatado nas normas da revista ***Systematic botany*** ISSN 1179-3163 (Qualis B1).

Taxonomic revision of *Bredemeyera* Willd. (Polygalaceae)

M. MOTA[1], F. B. MATOS[2], R. GOLDENBERG[2], J. F. B. PASTORE[3]

[1] *Programa de Pós Graduação em Botânica, Universidade Federal do Paraná, Av. Francisco H. dos Santos s.n., Campus do Centro Politécnico, 81531-980, Curitiba, Paraná, Brasil. E-mail: mcamota@outlook.com.*

[2]*Universidade Federal do Paraná, Av. Francisco H. dos Santos s.n., Campus do Centro Politécnico, 81531-980, Curitiba, Paraná, Brazil.*

[3]*Universidade Federal de Santa Catarina, Campus Curitibanos, Rodovia Ulisses Gaboardi, km 3, Curitibanos, 89520-000, Santa Catarina, Brazil.*

Abstract— *Bredemeyera* Willd. has 13 species with neotropical distribution, from Mexico to Paraguay. In Brazil, where all species occur, the genus is distributed in all its regions except in the extreme south of the country, that is, in the states of Santa Catarina and Rio Grande do Sul, the state of Bahia with the largest number of species. The names *Bredemeyera lucida* Benth. ex Klotzsch and *B. altissima* A.W.Benn. are considered taxonomic synonyms of *B. divaricata* (DC.) J.F.B.Pastore and *B. disperma* (Vell.) J.F.B.Pastore a synonym for *B. laurifolia* (A.St.-Hil. & Moq.) Klotzsch ex A.W.Benn. This study includes: identification key, morphological description, taxonomic comments, distribution map, conservation status and illustrations of floral pieces and habit for all species, besides typifications for some names, wealth map for the genus and species, and description of a new species endemic to the State of Piauí, *Bredemeyera pastoreana* M.Mota.

Keywords—South America, Endemism, Atlantic Forest, Amazon.

Polygalaceae has 27 genera and about 1,200 species (Pastore et al. 2017), distributed over almost the entire land surface, except for desertic or ice regions of the planet. The family is considered monophyletic and belongs to the order Fabales (APG IV 2016). Presenting four tribes Carpolobieae B.Eriksen, Diclidanthereae Reveal, Xanthophylleae Baill. and Polygaleae Chodat (Eriksen & Persson 2007, Reveal et al. 2012), the last one presenting flowers reminiscent of the papilionaceous flowers of legumes (however, in Polygalaceae the keel is formed by a single petal and the wings are petaloid sepals, while in Fabaceae the 'wings' are petals and the carina is formed by the fusion os two petals (Pastore 2006)).

The genus *Bredemeyera* was described in 1801 by Willdenow to honor his friend Franz Bredemeyer, who collected in Caracas (Venezuela), the type of the only species originally included in the genus, *B. floribunda* Willd. (Willdenow 1801). The delimitation of the genus was not readily recognized by other contemporary botanists and thus the next new species of *Bredemeyera* were described in other genera such as *Securidaca* (*S. hebeclada* DC), *Badiera* (*B. divaricata* DC.) and *Polygala* (*P. disperma* Vell.).

Saint Hilaire (1828a, b) synonimized *Bredemeyera* in the Australian genus *Comesperma* Labill., expanding the delimitation of this to include South American species, thus he described three new species of *Comesperma* for Brazil and combined the type species of *Bredemeyera* in *Comesperma*, as *C. floribunda* (Willd.) A.St.-Hil. & Moq., since then *Bredemeyera* had its delimitation confused with the genus *Comesperma*.

Apparently without knowing the name *Bredemeyera*, and without accepting the relation of the Brazilian and Australian species, Bentham (1842) created the genus *Catocoma* Benth., For which he described new species and transferred all Brazilian species of *Comesperma* described by Saint-Hilaire, including *Comesperma floribunda.*

Later Bentham (1851) commented the delimitation of *Bredemeyera*, suggested by Klotzsch by the 'name' *Bredemeyera bracteata* Klotzsch (at that time not validly published by Klotzsch, thus a *nomem nudum*). In this note, it was indicated that the differences between *Bredemeyera* and *Catocoma* would be in the fruit, citing that Willdenow described *Bredemeyera* as "drupa ovata nuce biloculari" (Willdenow's error) and compared it with *Catocoma* described by him with fruits in capsule. Hasskarl (1864) used the name *Bredemeyera* rather than *Catocoma* and described some herbarium names of Klotzsch as *B. moritziana* Klotzsch ex Hassk. and *B. bracteata* Klotzsch ex Hassk.

Among the most significant studies with the genus is the *Flora brasiliensis* (Bennett 1874) which, in addition to presenting new species, included combinations in *Bredemeyera*, leaving it with a circumscription close to the current one.

Van Steenis (1968) recovered the idea that *Comesperma* and *Bredemeyera* would be better under the same genus, but unlike the other authors, this one uses the oldest name, *Bredemeyera* (1801 vs. *Comesperma* of 1806).

In this way, this last author presented several new combinations of *Comesperma* in *Bredemeyera* (see in "Excluded taxa"), in addition to describing a new species for Papua New Guinea, *Bredemeyera papuana* Steen. Subsequently, Pedley (1984) again treated *Bredemeyera* and *Comesperma* as independent genera in his study on *Comesperma* for the state of

Queensland, Australia, and although he commented that *B. papuana* would be better grouped in the genus Comesperma, the author did not group it in the genus.

The morphological similarities that mistakenly incited the union of these genera are mainly the long trichomes in the seeds and the obovate long capsules. However, phylogenetic studies based on molecular markers evidenced the distinction of the two genera since *Comesperma* and *Bredemeyera* emerged safely in relatively distant clades (Persson 2001, Pastore et al 2017). Not only by the phylogeny, but also these genera are morphologically distinct and with different occurrence areas.

While *Bredemeyera* is restricted to the neotropical region, *Comesperma* is restricted to Oceania. Morphologically, the two genera are distinguished by the halo of the seeds from which the long trichomes come out and by the type of inflorescence. In *Bredemeyera*, the halo in the seeds is formed only at the apex and the inflorescences are composed (panicles), whereas in *Comesperma* the halo presents throughout the body of the seed, and the inflorescences are simple racemes.

After Marques (1980), who presented a taxonomic study for the Brazilian species of *Bredemeyera*, the taxonomy of *Bredemeyera* was approached only in specific articles such as Pastore (2010, 2014a, 2014b), in which three new combinations were proposed in the genus, *Bredemeyera hebeclada* (DC.) J.F.B.Pastore, *B. divaricata* (DC.) J.F.B.Pastore e *B. disperma* (Vell.) J.F.B.Pastore, in addition to Mota & Pastore (2018) with the description of two new species *B. atlantica* M.Mota & J.F.B.Pastore and B. *petiolata* M.Mota & J.F.B.Pastore. Recently, Mota et al. (*in press)* segregate two lineages *Bredemeyera colletioides* and *B. microphylla* as new genera, based in morphological and molecular analyses.

Thus, the present study is a taxonomic revision of the genus *Bredemeyera,* presenting an inventory of the species of *Bredemeyera*, morphological descriptions, photographic plates, geographic distribution, conservation status, species identification key and taxonomic revision.

MATERIAL AND METHODS

Access to specimens—For the morphological studies in *Bredemeyera*, the herbaria CEN, CESJ, CORD, CTES, HUEFS, MBM, R, RB e UPCB (acrônimos segundo Thiers 2019), were visited, as well duplicates sent by the herbaria to the herbarium CTBS (herbarium where this study was performed) by herbaria: ASE, CEN, HUFU, MBML, SPF and specimens evaluated by photos through the INCT - Virtual Herbarium of Flora and Fungi (2019) and Reflora - Herbarium Virtual (2019). Field expeditions to the northeast of Goiás (Chapada dos Veadeiros), west (municipality of Correntina and surroundings) and center (Chapada Diamantina) of Bahia

where specimens of *B. floribunda* Willd., *B. laurifolia* (A.St.- Hil. & Moq.) Klotzsch ex AWBenn., *B. brevifolia* and *B. barbeyana* Chodat.

Tipification— For typification, the prototypes of the names involved in this review were examined by comparing them with the historical collections of several herbaria available on the internet, as well specimens were studied in herbaria B, BM, BR, CEPEC, CGE, COL, E, G, K, L, M, MG, MPU, NY, U, visited and their specimens photographed by JFBP. When more than one original (usually specimen) element was available, the lctotipification was made. The choice for the lectotype was based on the evidence contained in the prototype, information available on the website Taxonomic literature II (available at http://www.sil.si.edu/DigitalCollections/tl-2/search.cfm), original author available on specimen labels and herbarium work and original description.

Distribution— For the analysis of the distribution of taxa, which were used for the preparation of maps and evaluation of conservation status, following the criteria of IUCN - International Union for Conservation of Nature (2017), a matrix for the coordinates of localities was developed. The coordinates of occurrence were based on the labels of the specimens examined, when the coordinates were not available on the labels, these were: 1. Inferred based on the information available on the labels, or when it was not possible to infer coordinates 2. The center of the municipality was plotted as a collection site. These data were analyzed using Qgis software 2.18.13 (2016), and later edited in Corel® PHOTO-PAINT ™ X7. The richness map for *Bredemeyera* was elaborated by the software Qgis 2.18.13 (2016), with grid cells of 2º × 2º, and calculated by the sum of all the species present in each cell. The conservation status of each species was inferred using the GeoCAT software (Bachman et al., 2011). The state of conservation assessments follow the parameters of IUCN version 13 (2017), where taxa were classified into seven categories: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC) or Data Deficient (DD), taking into account the number of locations, area of occupancy (AOO), extension of occurrence (EOO) and habitat quality.

Morphological analyzes—For species description, morphological analyzes of the structures under stereomicroscope were carried out, where the floral pieces were photographed with the software Toup View® for later confection of the boards. The process of editing images for mounting the photo boards was done using the Corel® PHOTO-PAINT ™ X7 software. The specific terminology needed to describe the species of Polygalaceae was based on that one traditionally adopted in the group (see Chodat 1893, Bennet 1874, Marques 1980 and Pastore 2006 as reference). As usually for the Polygalaceae family, the structures at the base of each

flower are called bracts (1 central) and bractoles 2 sides). The inflorescences were described based on herborized (ie, planed) materials.

RESULTS

BREDEMEYERA Willd., Ges. Naturf. Freunde Berlin Neue Schriften**,** 3: 412. 1801. *Comesperma* sect. *Bredemeyera* (Willd.) Baill., Hist. Pl. (Baillon) 5: 82. 1874. TYPE: *Bredemeyera floribunda* Willd.

Catocoma Benth. in Hooker, Journ. Bot. 4: 101. 1842. TYPE: *Catocoma floribunda* (Willd.) Benth. Fig. 1

Woody vines, sub-erect or scandent shrubs; **Leaves** simple, alternate, margin entire, blades varying in size and shape in the same specimen. **Panicles** (racemes compounds) with different orders, terminal or axillary, branches terminated in an apical racem that can be umbelliform, triangular or capitated; 1 central bract and two lateral bractoles at the base of the pedicel (or flower, when sessile), smaller than the external sepals. **Flowers** sessile or pedicellate, whitenish corolla, keel and ventral surface of lateral petals yellowish or greenish, zygomorphs, unisexual, external sepals 5: 3, usually ovate and 2 internal (wings), larger and expanded; 5: 2 lateral petals, fused at the base of the filament sheath, eventually with an expanded apex (inclined and serving as a "landing strip" for pollinators; a keel surrounds the androecium and the gynoecium, often unguiculated, trilobate keel, 2 rudimentary petals also fused at the base of the filament sheath, small not larger than 3 mm in length (absent in *B. petiolata*), calyx and corolla deciduous in the fruits, stamens 8, proximally connated forming an expanded staminal sheath, fillets free in the distal part, staminal sheath involving the gynoecium, anthers basifix. Gynoecium compressed laterally, style arched or straight angle, bilocular ovary. Loculicidal **capsules**, glabrous, usually obovate, less variable between species, (except for *B. brevifolia* and *B. floribunda* which is hairy and spatulate). **Seeds** are also similar among species, which present the body covered by short trichomes and its aryl at the apex has

long trichomes that exceeded the size of the seed (to facilitate anemocoric dispersion).

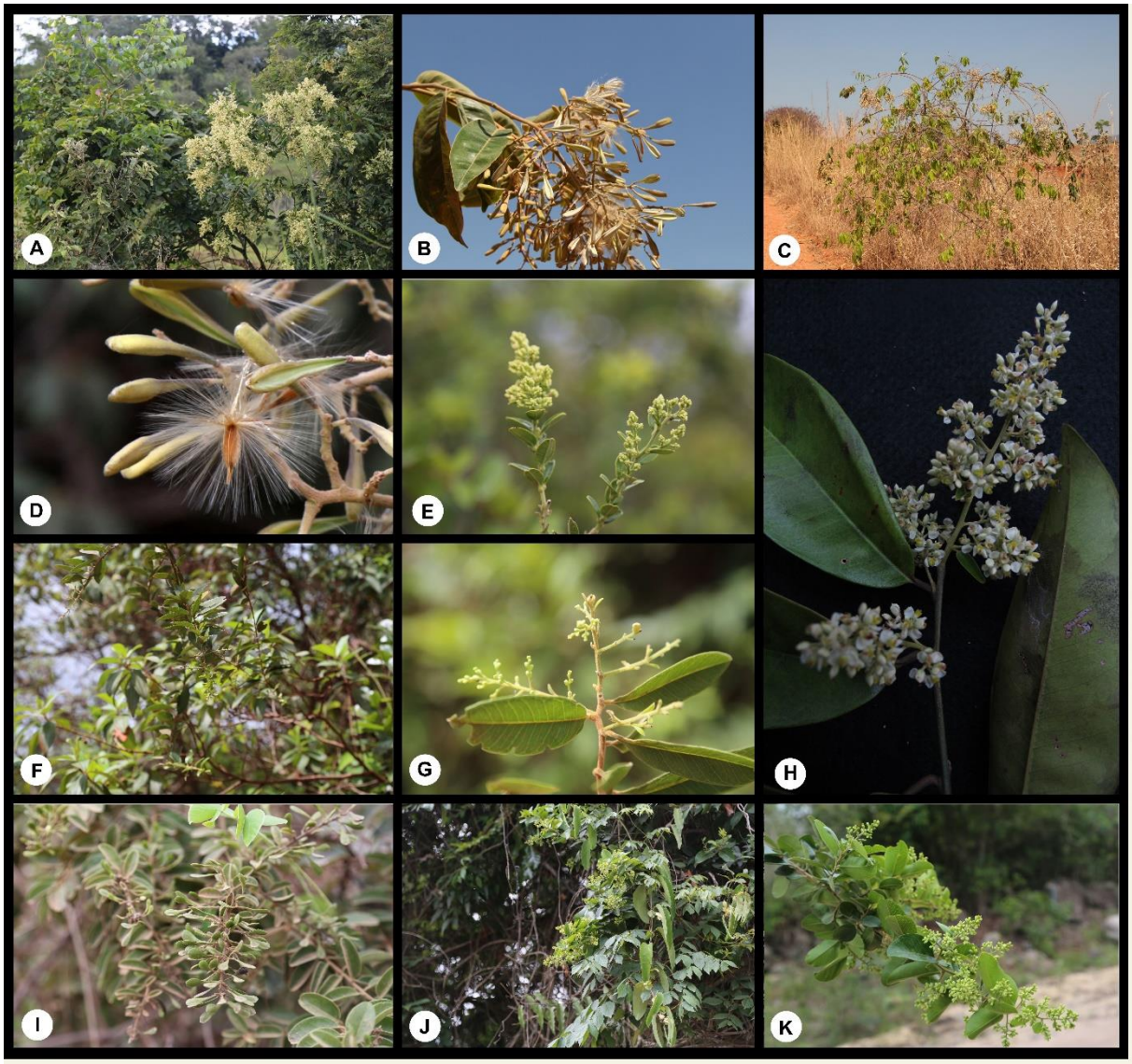
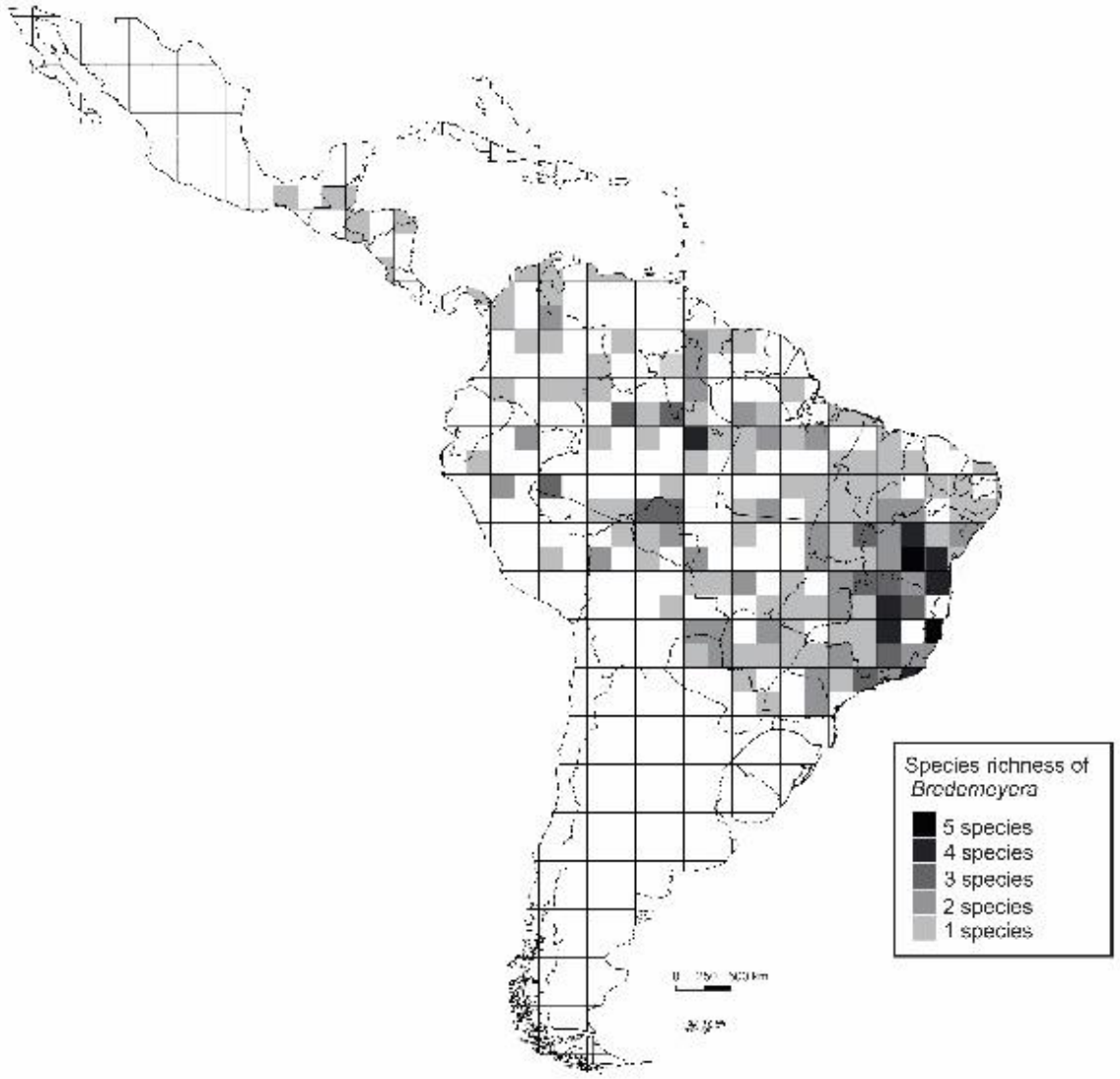


FIG. 1. A–D. *Bredemeyera floribunda* Willd.; E. *B. barbeyana* Chodat; F e G. *B. hebeclada* (DC.) J.F.B.Pastore; H. *B. divaricata* (DC.) J.F.B.Pastore; I-K. *B. brevifolia* (Benth.) Klotzsch ex A.W.Benn. (Photos by. A, F, G, I–K. Michelle Mota & Flor

***Distribuition*—**The genus has 13 species occurring from southern Mexico to Paraguay. All species occur in Brazil, distributed in almost all of their states, not occurring only in the extreme south (states of Santa Catarina and Rio Grande do Sul). A new species is described here for the state of Piauí, and a new occurrence for the state of Amapá. Despite the genus occurs in all the

phytogeographic domains of Brazil, except in the southern pampas, the richness map (2) shows that *Bredemeyera* has more species in the Atlantic Forest and Caatinga.



. FIG. 2. Species richness map of *Bredemeyera* Willd., in grid cell of of 2º × 2º.

KEY TO THE SPECIES OF *BREDEMEYERA*

1. Subsessile leaves.....2

1'. Pedicellate leaves.....3

2. Leaves oblong to ovate, with margin not revolute.....(2) *B. barbeyana*

2'. Leaves elliptical to obovate, with margin revolute.....(12) *B. pastoreana*

3. Sessile Flowers.....4

3'. Pedicellate Flowers.....6

4. Ring of trichomes in the ovary base.....(1) *B. atlantica*

4'. Ring of trichomes absent in the ovary base.....5

5. Flowers 3–4 mm, filament sheath 2.3–3 × 1–1.5 mm.....(8) *B. hebeclada*

5’. Flores 4–6 mm, filament sheath 3.5 × 1.5–2.2 mm.....(9) *B. laurifolia*

6. Keel not clawed, lateral petals with apex wided, style straight.....7

6’. Keel clawed, lateral petals with apex not wided, style arched.....8

7. Leaves 6(6.5–)–10(–12.2) × (2.2–)3–4(–5.8) cm, panicles lax, triangular racemes, ovary densely pubescent, style glabrous.....(7) *B. floribunda*

7’. Leaves 2.5–6.5 × 1.5–3.3 cm congested panicles, capitated racemes, ovary puberulous, style pubescent in the basal portion.....(4) *B. brevifolia*

8. Pedicel glabrous, racemes umbeliform.....(11) *B. myrtifolia*

8’. Pedicel puberulous to velutine, triangular or capitated racemes…….9

9. Racemes triangular and lax.....10

9’. Racemes capitated and congested.....11

10. Leaves velutine in both surfaces, keel glabrous in both surfaces, panicles densely velutine.....(10) *B. martiana*

10’. Leaves glabrous to puberulous in both surfaces, only in the main vein, keel puberulous to tomentose in dorsal surface (central), panicles tomentose.....(6) *B. divaricata*

11. External sepals with apex acute, internal sepals not ciliate, lateral petal symetrical….....(3) *B. bracteata*

11’. External sepals with apex acute, internal sepals ciliate at the base, lateral petals assymetrical.....12

12. Leaves coriaceous, bracts triangular to linear, petiole 2.8–3 mm, capsules 13.1 × 5.2 mm.....(5) *B. cuneata*

12’. Leaves carthaceous, bracts ovate, petiote 3–6 mm, capsule ca. 7–9 × 2–3 mm.....(13) *B. petiolata*

BREDEMEYERA ATLANTICA M.Mota & J.F.B.Pastore, Phytotaxa 351(2): 171. 2018. TYPE: BRAZIL. Espírito Santo: Presidente Kennedy, Praia das Neves, entre as rodovias ES 060 e 261, 21º13'3"S, 40º57'39”W, 15 Jun 2004, *A.M.Assis & M.D.S.Demuner 1992* (holotype: CTBS2257!, isotypes: MBM, MBML40970). Fig. 3.

Scandent shrub, branches velutine. **Leaves** chartaceous; petiole 5–6 mm long., velutine; blade 2.6–5.1 × 1.4–2 cm, obovate to elliptic, apex obtuse to rounded, rarely acute, not mucronate, base acute, margin not revolute, adaxial surface puberulous to velutine, abaxial surface velutine. **Panicles** lax, main axis straight, velutine; racemes triangular. **Flowers** 2.8–3 mm long., bracts e bracteoles subequal 1 × 0.6–0.8 mm, ovate, apex rounded, pubescent in dorsal surface, glabrous in ventral surface. Sessile, external sepals 1.5 × 1.2–2 mm, ovate–oblong, apex rounded, not mucronate, glabrous on both surfaces, ciliated, internal sepals 1.5–2.5 × 1.7–2

mm, oblong–obovate, apex rounded, not mucronate in dorsal surface, glabrous on both surfaces, ciliated in base; keel (excluding claw) 1.5–2 × 1.8–2 mm, glabrous on both surfaces; claw 0.5 mm long., ciliated; lateral petals 2 × 1–1.3 mm, slightly constricted in the median portion, asymmetrical, apex rounded, not wided, glabrous in dorsal surface, puberulous in median portion in ventral surface, ciliated in basal half; filament sheath 2 × 1–1.5 mm, externally puberulous in the apex, internally glabrous, free filaments ca. 1 mm long., glabrous; style 2–2.2

mm long., arched, glabrous; ovary 0.7 × 0.4–0.5 mm, oblong, glabrous, without ring of trichomes in the base. **Capsule** 9–11 × 3.5–4 mm, obovate, apex rounded, marginate, glabrous.

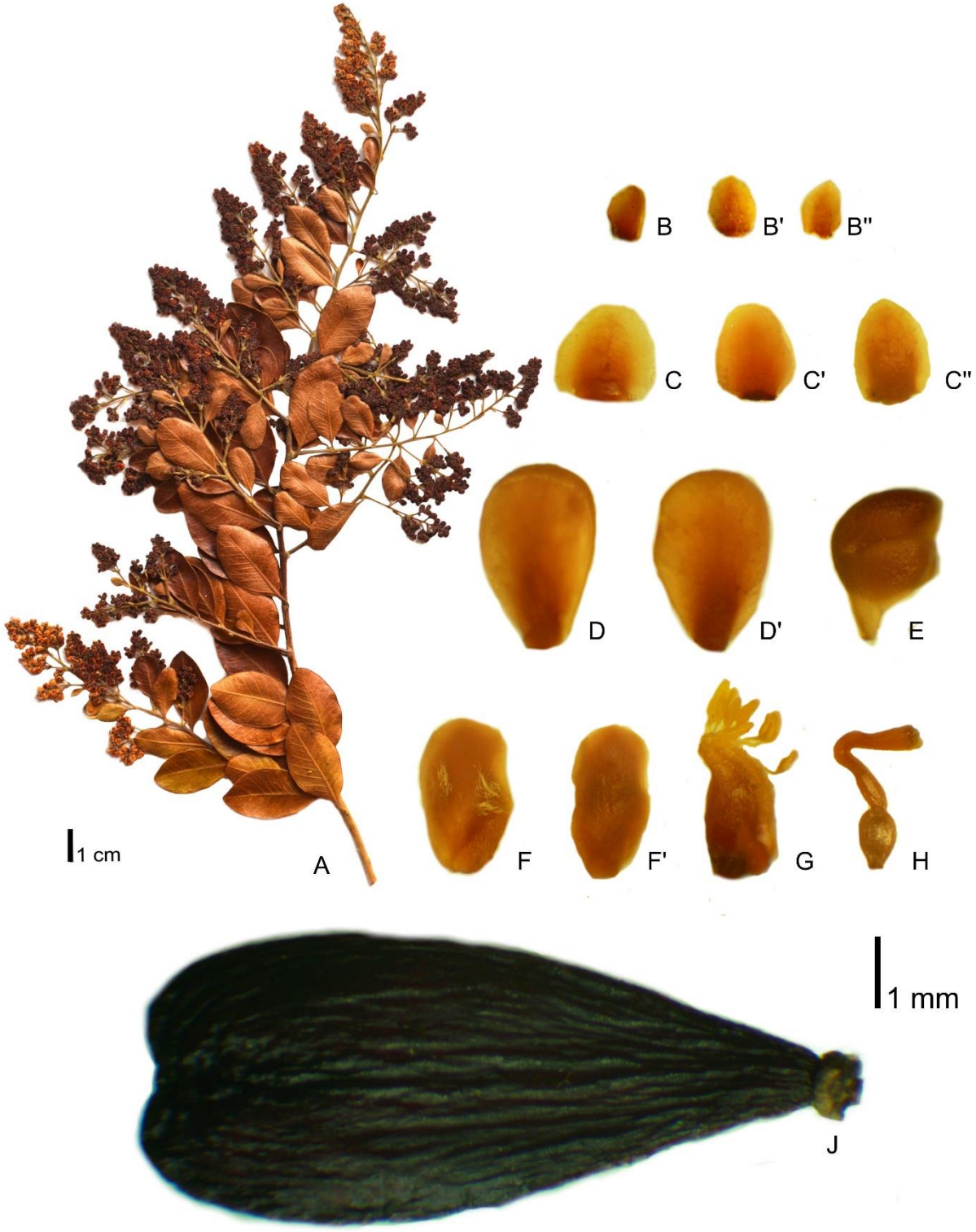


FIG. 3. *Bredemeyera atlantica* M.Mota & J.F.B.Pastore. **A.** Habit; **B**, **B'**e **B".** Bract and bracteoles; **C**, **C'** e **C".** External sepals; **D** e **D'.** Internal sepals; **E.** Keel; **F** e **F'**. Lateral petals; **G.** Androecium; **H.** Gynoecium e **J.**

Capsule (**A.** *A.M. Assis & M.D.S. Demuner 1992* (RB); **B–H.** *L. Krieger s.n.* (CTBS) e **J.** *L.C. Giordano et al. 2384* (CTBS)).

Distribuition—*Bredemeyera atlantica* is endemic of the coastal region of Espírito Santo and Rio de Janeiro states. Fig. 4

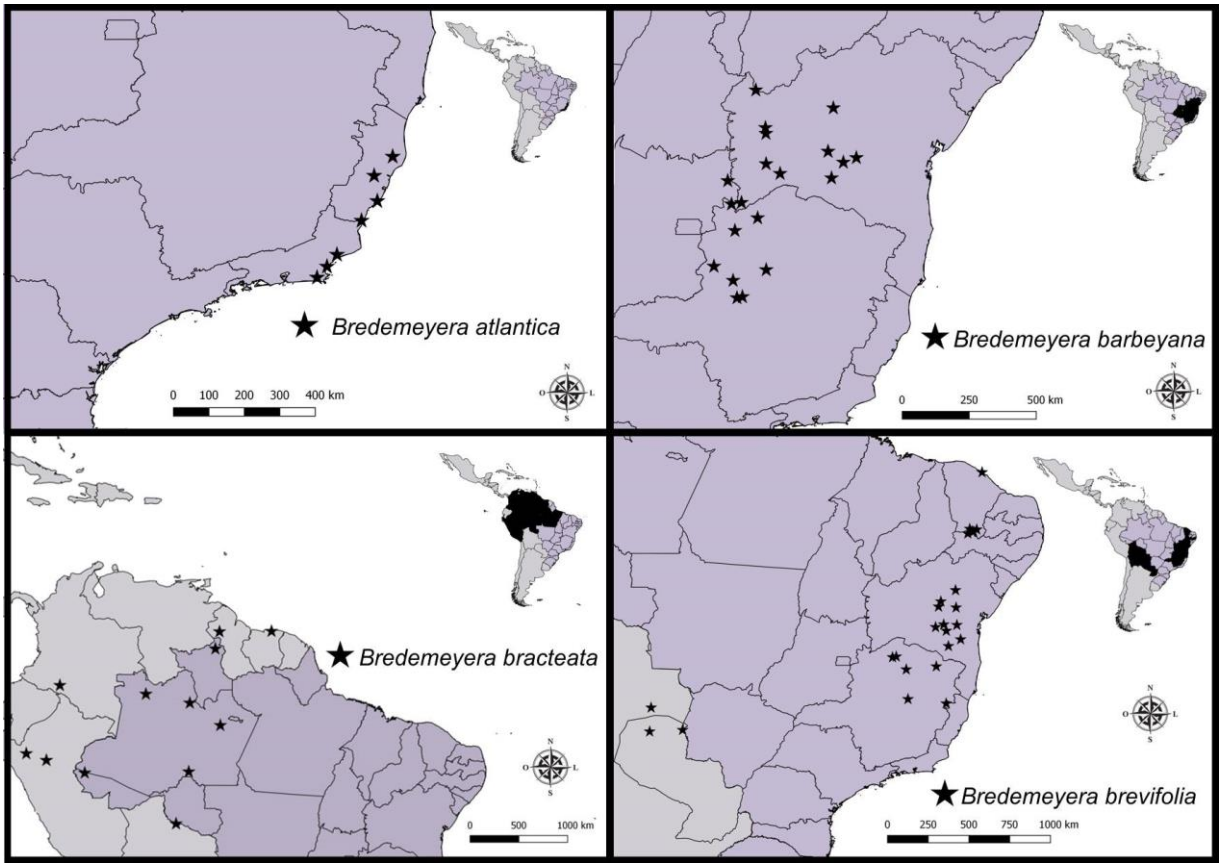


FIG. 4. Distribuition map of *Bredemeyera atlantica* M.Mota & J.F.B.Pastore, *Bredemeyera barbeyana* Chodat, *Bredemeyera bracteata* Klotzsch *ex* Hassk. and *Bredemeyera brevifolia* (Benth.) A.W.Benn.

Conservation status—According to IUCN (2017) criteria, the occurrence extension (EOO) 11.371,690 km², the area occupancy (AOO) 28 km², and the quality of the habitat, *Bredemeyera atlantica* fits as "Vulnerable" [VU B1 + 2a(2), b (iii)]. The species is endemic of the coastal region of Espírito Santo and Rio de Janeiro states.

The habitat decline of this species is anticipated considering that the areas of restingas near the cities have been suppressed with the urban expansion.

Taxonomic notes—Although occurring in historically collected areas, such as the coastal region of the State of Rio de Janeiro, *Bredemeyera atlantica*, was only recently described (Mota & Pastore 2018). Specimens of Bredemeyera atlantica were commonly found identified as *B. kunthiana* (A.St.-Hil. & Moq.) Klotzsch ex A.W.Benn. (= *Bredemeyera hebeclada* (DC.) J.F.B.Pastore).

Bredemeyera atlantica is related to *B. laurifolia* (A.St.-Hil. & Moq.) Klotzsch ex A.W.Benn. and *B. hebeclada*, by the sessile flowers and pyramidal inflorescence. However, *B. atlantica* can be differentiated by flowers 2.8-3 mm (vs 3-4 mm in *B. hebeclada* and 5-6 mm in *B. laurifolia*) and absence of a ring of trichomes in the ovary base (vs present in *B. hebeclada* and *B. laurifolia*).

***Specimens Examined*—Brazil.—**ESPÍRITO SANTO: Guarapari, 16 Apr 1984, *L. Krieger s.n.* (CESJ, CTBS); Linhares, Reserva da Companhia Vale do Rio Doce, 8 Apr 2006, *J.G. Rando et al. 212* (MBM, RB); Presidente Kennedy, Praia das Neves, entre as rodovias ES 060 e 261, 21º13'3,1"S, 40º57'39,5"W, 15 Jun 2004, *A.M. Assis & M.D.S. Demuner 1992* (CTBS, MBM); Santa Teresa, Pedra Alegre, 13 Apr 1996, *H.Q. Boudet Fernandes et al. 3162* (CTBS, MBML); Pedra da Onça, 16 Apr 1986, *H.Q. Boudet Fernandes et al. 1930* (CTBS, MBML); Pedra da Onça, 26 Jun 2003, *A. M de Assis et al. 887* (CTBS, MBML).—RIO DE JANEIRO: Carapebus, estrada de acesso à Fazenda São Lázaro a caminho da praia, 15 Aug 1996, *I.M. da Silva & J.G. Silva 351* (R); Iguaba Grande, área do NEIG/UFF, Ponta da Farinha, 22º50'53"S, 42º11'47"W, 19 May 2005, *H.C Lima et al. 6345* (RB, UEC); Rio das Ostras, 5 Apr 1971, *L. Krieger s.n.* (CESJ, CTBS); Rio das Ostras Balneário das Garças, 14 Dec 1999, *R.N. Damasceno* (RB).

BREDEMEYERA BARBEYANA Chodat, Bull. Herb. Boissier 2: 173. 1894. "Gardner leg. ann. 1841, in Brasil. Prov. Piauhy, n° 2777 (v.s. in Hb. Delessert et in Hb. Barbey-Boissier)". TYPE: BRAZIL. Bahia: Formosa do Rio Preto, 7 Sep 1839, *G.Gardner 2777* (lectotype, designate by Marques (1980): G. isolectotypes: B[† foto F neg. 13075], BM!, CGE!, E[00631952], K[000263982]!, K[000555739!], NY[00846431], P[00733600]!, P[03263742]!, W[1889-0197123]!). Fig. 5

Scandent to erect shrub, branches tomentose, rarely glabrous. **Leaves** coriaceous; subsessile, petiole 1–2 mm long., pubescent, adpress to the stem; blade 1.3–3 × 1–2.3 cm, oblong to ovate, apex rounded, rarely acute, mucronate, base obtuse to rounded, margin not revolute, adaxial surface glabrous to puberulous in the main vein, abaxial surface velutine, rarely glabrous on both surfaces. **Panicles** congested, main axis straight, velutine, rarely glabrous; racemes capitated. **Flowers** 5–5.5 mm long., bracts 1.8 × 1 mm, ovate, apex acute, pubescent in dorsal surface, glabrous in ventral surface, bracteoles 1.5 × 0.8 mm, elliptics, apex rounded, puberulous in median portion in dorsal surface, glabrous ventral. Pedicellate; pedicel ca. 2 mm, long., glabrous, external sepals 2.1–2.5 × 2 mm, ovate, apex rounded, slightly

mucronate in dorsal surface, pubescent in both surfaces, ciliated, internal sepals 3–3.5 × 2.5–2.7 mm, obovate–oblong, apex obtuse, slightly mucronate in dorsal surface, glabrous on both surfaces, not ciliated; keel (excluding claw) 2.5 × 1–1.2 mm, glabrous on both surfaces; claw 0.5 mm long., ciliated; lateral petals 2 × 1.5 mm, slightly constricted above the median portion, symmetrical, apex rounded, not wided, glabrous on both surfaces, unilaterally ciliated; filament sheath 2 × 1.2 mm, externally puberulous in the apex, internally glabrous, free filaments 0.8–1 mm long., glabrous; style 2–3 mm long., arched, pubescent in the basal portion; ovary 0.8 × 0.8 mm, orbicular, glabrous, without ring of trichomes in the base. **Capsule** 11 × 4 mm, obovate, apex rounded, emarginate, glabrous.

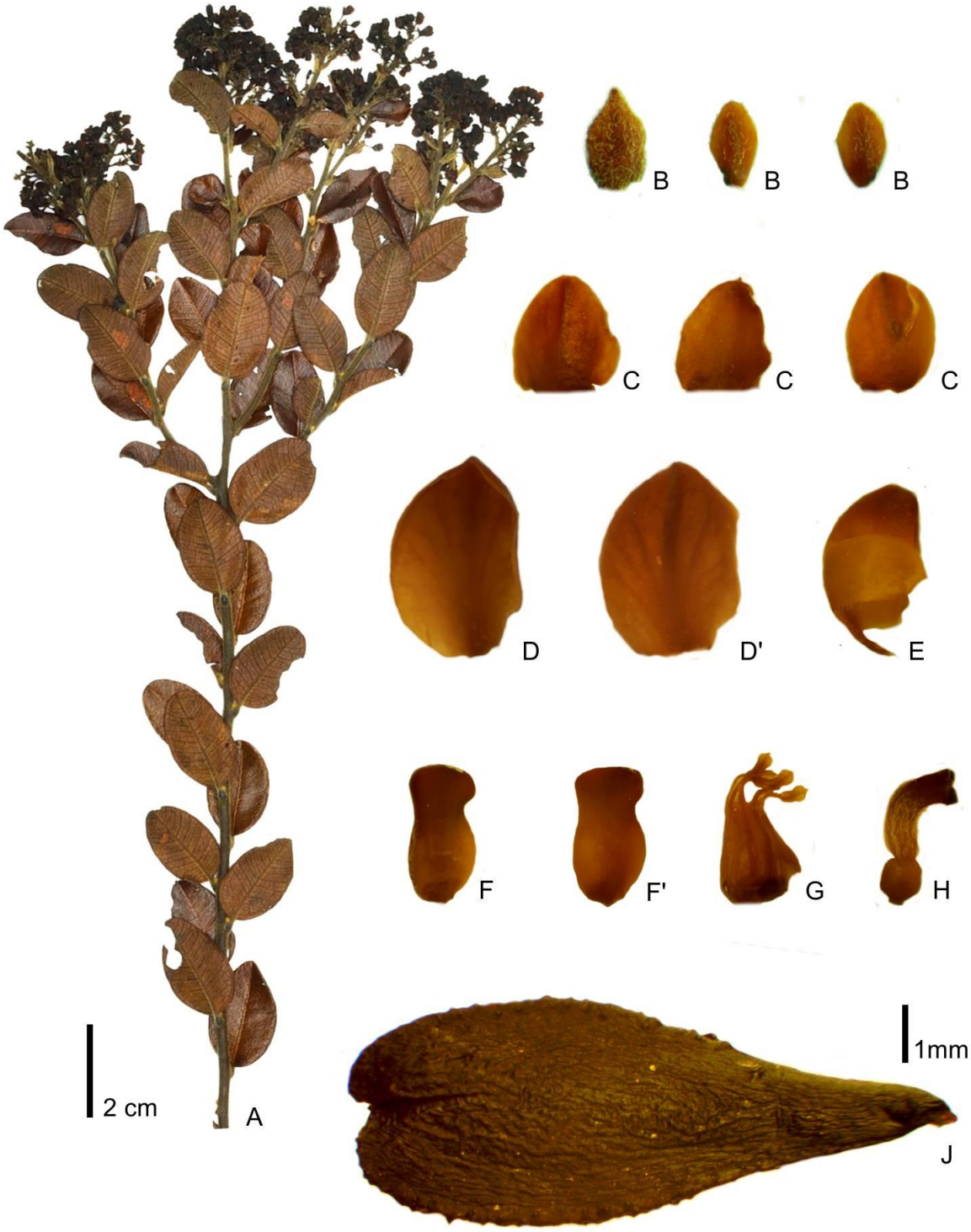


FIG. 5. *Bredemeyera barbeyana* Chodat. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium; J. Capsule. (A. *S.B. da Silva & R.P. Orlandi 388* (MBM); B–H. *M. Mota* & *J.F.B. Pastore 125* (CTBS); J. *G. Hatschbach & O. Guimarães 42290* (CTBS)).

Distribuition—*Bredemeyera barbeyana* occurs in Bahia, Minas Gerais and was found a new record to Goiás state. Fig. 4

***Conservation status*—**The extension of occurrence (EOO) de 266.325 km², area of occupancy (AOO) de 80 km^2, the species was included in “less concern” following the IUCN (2017) criteria.

***Taxonomic notes*—**In the protologue of *B. barbeyana,* Chodat (1894) cites as type locality “Piauhy”, in fact, the material (*G.Gardner 2777,* G), for the original description of the species contains on the label this locality, as well as other specimens of the collection-type contains in the labels: "Pernambuco". Analising the toponymy (related to the collection number G.Gardner 2777) of the itinerary contained in the transcription of G. Gardner's manuscripts (Hind, 2012 - available on the RBG Kew website), as "Santa Rosa" (currentely Santa Rosa Farm, reference point 10º59'33"S, 45º46'36" W), "Serra da Batalha" (reference point 10º51'53"S, 45º17'57"W) on specimen K000555739 and "Rio Preto" (now Rio Preto Formosa city), these localities in 1839 had been recently separated from Pernambuco. In 1824, this region became the western portion of Bahia, thus, considering the current distribution of the species, it is believed that the G.Gardner 2777 lectotype was collected in the city of Formosa do Rio Preto-BA.

***Specimens Examined*—Brazil.—**BAHIA: Abaíra, distrito de Catolés, Sítio Palmeias, serra do Porco Gordo, 13º23’S, 41º46’W, 25 Apr 1992, *W. Ganev 201* (HUEFS, NY); Barreiras, Br 020, 10 km O de Roda Velha, 12 jul 1979, *G, Hatschbach & O. Guimarães 42290* (CTBS, MBM); Buritizeiro, rodovia 365, próximo ao km 204, 18 Mar 1995, *G. Hatschbach et al. 62040* (CTBS, MBM); ca. 15 km de Caetité, 13º59'34"S, 42º34'22”W, 28 Aug 1999, *E. Melo et al. 2880* (HUEFS); Cocos, Faz. Trijunção. Área da sede Santa Luzia, 14º53'26"S, 45º52'00”W, 6 jul 2001, *M.L. Fonseca et al. 2859* (SPF, IBGE); Coribe, estrada para reflorestamento DESBRAVA, 17 Mar 1984, *J.E.R. Collares & M.M. Fernandez 111* (RB); Correntina, Estrada para Posse-Correntina, na entrada da Faz. Pula Pula, 13º28'24,9"S, 44º57'56,4”W, 27 Fev 2017, *M. Mota & J.F.B. Pastore 125* (CTBS, UPCB); Érico Cardoso, Vereda, estrada Capão em direção à Vereda, 13º16’7”S, 42º8’45”W, 5 Jul 2001, *N. Roque et al. 582* (HUEFS); Formosa do Rio Preto, 10º46'30"S, 45º20'30”W, 6 May 2004, *S.B. da Silva & R.P. Orlandi 388* (HRB, MBM); Macaúbas, Lagoa do Maurício, 15 Jun 2004*, G. Hatschbach et al. 77847* (MBM); Macaúbas, estrada de Macaúbas para Tingui, 13º5’10”S, 42º45’12”W, 7 Jul 2017, *A.A. Conceição et al. 2495* (HUEFS); São Desidério, 9 km from São Desidério, 12º19’S 44º59’W, 24 jul 1998, *J.A. Ratter et al. 8032* (HUEFS).—GOIÁS: Posse, Serra Geral, estando a 3 km da cidade de Posse, pela Br 020, 20 May 1983, *J.A. Rizzo et al. 10278* (RB, UFG).—MINAS GERAIS: Arinos, RPPN Arara Vermelha (próximo à porteira de entrada), estrada para Chapada Gaúcha-MG, 15º26’41,6”S, 45º48’46,7”W, 26 May 2004, *M.L. Fonseca et al. 5422* (IBGE,

HUEFS); Formoso, Parque Nacional Grande Sertão Veredas, carrasco próximo à casa do Guarda Parque Gualdino, 15º11128”S, 45º50’18”W, 17 Fev 1999, *R.C. Mendonça et al. 3795* (IBGE, RB); João Pinheiro, Rod. BR-040, 22 Fev 1975, *G, Hatschbach et al. 36399* (MBM, UPCB); Paracatu, 3 Jun 1960, *E.P. Heringer 7562* (UB, US); São Gonçalo do Abaeté, rodovia 365, 10-15 km S do trevo com a rodovia BR, 11 Mar 1995, *G Hatschbach et al. 61764 (*MBM); São Gonçalo do Abaeté, 6 km depois de Luizlândia do Oeste, 18º00’31”S, 45º33’20”W, 7 Sep 2013, *R.G. Chacon et al. 1181* (HEPH); Varjão de Minas, arredores, 12 Mar 1999, *G. Hatschbach et al. 68979* (INPA, MBM).

BREDEMEYERA BRACTEATA Klotzsch *ex* Hassk., Ann. Mus. Bot. Lugduno-Batavi 1: 187. 1864. “Hab. Guiana anglica, ad fl. Demerary: R. Schomburgk”. TYPE: GUYANA. Demerara: Mar 1844, *R.H.Schomburgk 1717* (lectotype, here designated: L[0537700], isolectotype: B[† foto F neg. 13074], L[0537699], P[00733604]!). Fig. 6

Bredemeyera densiflora A.W.Benn., Fl. Bras. (Martius) 13(3): 52. 1874. "Species rara distinctissima habitat in sylvis recentioribus regionis Amazonicas, atque in montibus secus flumen Mayo, prope Tarapoto, Peruviae orientalis: Spruce n. 4801 (sub nomine Catocoma parviflora) et Mathews n. 1621 bis”. TYPE: PERU. San Martín: Lamas, Aug 1856, *R.Spruce 4801* (lectotype, here designated: K[000202404]!, isolectotypes: B[† foto F neg. 13078, C[10017323], CGE!, K[000202405]!, NY[399987], other specimens cited in the protologue: PERU. *Mathews 1621,* CGE!).

Bredemeyera densiflora var. *glabra* A.W.Benn., Fl. Bras. (Martius) 13(3): 52. 1874. "In Surinamia: Hostmann 1152, et Roraima, Brit. Guiana: Schomburgk n. 1007". TYPE: SURINAME. No locality, no date, *F.W.R.Hostmann 1152* (lectotype, here designated: W[0068501], isolectotypes: F[839039], G[00440295]!, K[000118448]!, K[000591154]!, NY[5969], P[00733601]!, U[0116233], other specimens cited in the protologue: BRAZIL, Roraima: 1843, *Schomburgk 1007,* BM[000027105]!, BM[000027017]!, G[00440294], K[000118447]!, NY[5970], P[00733602]!, P[00733603]!, W[1889-0107129]!).

Scandent shrub, branches tomentose. **Leaves** chartaceous; petiole 4–6 mm long., tomentose; blade 3.2–6.2 × 1.5–3 cm, ovate to obovate, apex acute to acuminate, not mucronate, base obtuse to rounded, margin not revolute, pubescent in both surfaces, rarely velutine in both surfaces. **Panicles** congested, main axis straight, tomentose; racemes capitated. **Flowers** 3.5–4.5 mm long., bracts 0.8 × 0.5 mm, ovate, apex acute, pubescent in dorsal surface, glabrous in ventral surface, bracteoles 0.7 × 0.3 mm, triangulares to linear, apex acute, densely pubescent

in dorsal surface, puberulous in ventral surface. Pedicellate; pedicel 1.5–2 mm, long., puberulous to pubescent, external sepals 0.8–1 × 0.8–1 mm, ovate to triangular, apex acute, not mucronate, glabrous to puberulous in both surfaces, ciliated, internal sepals 2–2.2 × 1.3–1.8 mm, obovate–oblong, rarely orbiculares, apex rounded, mucronate in dorsal surface, glabrous to puberulous in both surfaces, not ciliated; keel (excluding claw) 1.5–1.8 × 1.2–1.3 mm, glabrous on both surfaces, rarely ciliated in base; claw 0.3–0.5 mm long., ciliated; lateral petals 1.3–1.7 x 1 mm, constricted in the median portion, symmetrical, apex rounded, not wided, glabrous on both surfaces, ciliated in lateral margins; filament sheath 1–1.2 × 2 mm, externally puberulous to pubescent in the apex, internally glabrous, free filaments 0.5–0.7 mm long., glabrous; style 0.9–1.2 mm long., arched, puberulous to densely pubescent in the basal portion; ovary 0.6 × 0.5 mm, orbicular to oblong, glabrous, without ring of trichomes in the base. **Capsule** 9–11 × 3–4 mm, obovate, apex rounded, emarginate, glabrous.

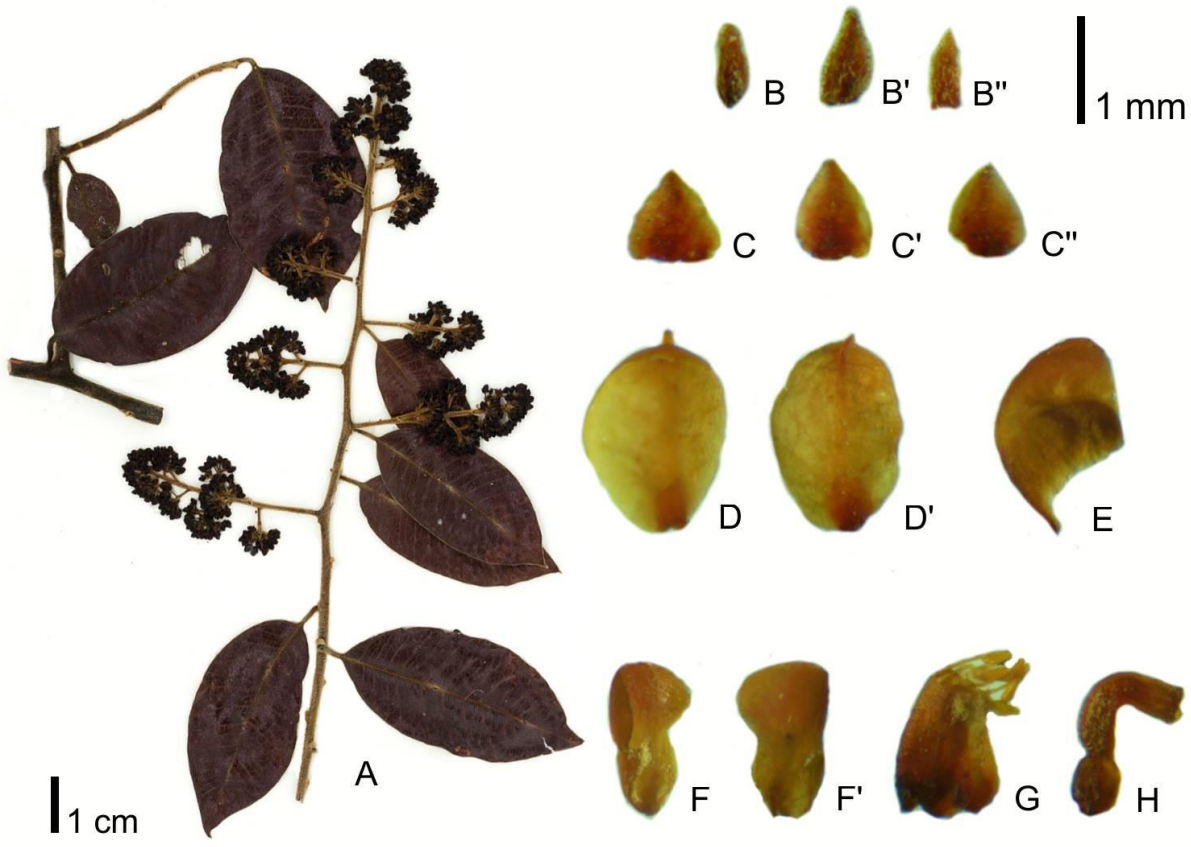


FIG. 6. *Bredemeyera bracteata* Klotzsch *ex* Hassk. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule (A. *D.C. Daly 8903* (RB) e B–H. *Pessoal do CPF s.n.* (RB)).

***Distribuition*—**The species is distribuited in Amazonas state in Brazil, Peru, Suriname, Guyana, Colombia e Venezuela. Fig. 4

***Conservation status*—**Presenting occurrence extension (EOO) of 2.897.379 km², and area occupancy (AOO) of 48 km^2, *Bredemeyera densiflora* can be classified as "Least concern" (LC), based on IUCN (2017) criteria.

***Taxonomic notes*—** *Bredemeyera densiflora,* name often used in Brazilian herbariums, is treated here as a synonym of *B. bracteata*. Two sheets of the herbarium K (K [000202404] and K [000202405]), cited in the prototype of *B. densiflora*, have the Bennett determination, so the choice of lectotype was made by the best preserved specimen.

The *Bredemeyera densiflora var. glabra* material reviewed by Bennet (Hostmann 1152) can be found in Vienna, in herbarium W (W [0068501]), a duplicate of this material with the same Bennett identification is found in F (F [839039]). The name *Bredemeyera bracteata* was mentioned by Klotzsch (1849), but the author did not present a valid diagnosis: "windender strauch", as *B. cuneata* case.

The L Herbarium, where Hasskarl worked, contains the lectotype [0537700] of *Bredemeyera bracteata*, although there are two specimens identified by Hasskarl deposited in this collection, the one chosen was the one in the best state of conservation.

***Specimens Examined*—Brazil.—**ACRE: Mâncio Lima PARNA Serra do Divisor, eastern piedmont, 7º28'00"S, 73º37'27"W, 6 May 1996, *D. C. Daly et al. 8903* (NY); Mâncio Lima, PARNA Serra do Divisor, trilha para o Mirante 7º26146,9"S, 73º40'21,2"W, 23 Aug 2008, *P. Fiaschi et al. 3360* (RB, NY).—AMAZONAS: Barcelos, margens do rio da Serra do Aracá, 30 Jan 1978, *N.A. Rosa & S.B. Lira 2314* (INPA, MG, NY); Humaitá, on plateau between Rio Livramento and Rio Ipixuma, 7-18 Nov 1934, *B.A. Krukoff's et al. 7136* (NY, US); Manaus, Cachoeira Grande 3 Jan 1943 *A. Ducke 1152* (MO, NY, US); Manaus, Igarapé do Uchí, estrada de Aleixo, 21 Mar 1958, *Pessoal do C.P.F. s.n.* (INPA, RB); Manaus, Manaus-Itacoatiara, Km 26, Reserva Florestal Ducke, 02º53'S, 59º58'W, 21 Sep 1994, *Vicentini et al. 705* (INPA, K, MBM, MG, MO, NY, RB, SP); São Gabriel da Cachoeira, road margin Camanaus-Uaupés, road near Camanaus, 1 Nov 1971, *G.T. Prance et al 15971* (INPA, NY, U, US, K, S, MG, F, A, K, P, M, MICH, C, G, MO, COL, VEM); São Gabriel da Cachoeira, Serra de Tunuí, Rio Içana, 28 Mar 1952, *N.I. Froes 28116* (IAN, UB); São Gabriel da Cachoeira, Tunuí, 13 May 1948, *G.A. Black 2669* (IAC, NY).—RONDÔNIA: Costa Marques, 23km, NW of Costa Marques on highway, Br 429 12º18'S, 64º17'W, Jan 1987, *M. Nee 34655* (HFSL, NY, US).—RORAIMA: 1842, *R.H Schomburgk & R.M. Schomburgk 1007* (BM, K, NY, P, W). **Colombia.—**SOLANO: Caquetá, Sierra de Chiribiquete, campamento Sur, planície del

campamento, 0º55'N, 72º45'W, 13 Dec 1990, *P. Palacios et al. 2373* (COL, MA). **Guyana:** Upper Mazaruni river, 22 Sep-6 Oct 1922, *J.S. de La Cruz* (F). **Suriname:** *F.W.R. Hostmann 1152* (F, G, K, NY, P, U, W). **Peru—**AMAZONAS: Bagua, 29 Aug 1996, *C. Diaz et al. 8059* (MO). SAN MARTIN: Lamas, Aug 1856, *R. Spruce 4801* (C, CGE, K, NY). **Venezuela—** COJEDES: San Carlos de Río Negro, 28-29 Jan 1930, *E.G. Holt & W. Gehriger 333* (RB).

BREDEMEYERA BREVIFOLIA (Benth.) Klotzsch *ex* A.W.Benn., Fl. Bras. 13(3): 49. 1874. *Catocoma brevifolia* Benth., J. Bot. (Hooker) 4: 103. 1842. "Serra Acurua in the province of Bahia; Blanchet n. 2926, and Villa do Barra on the Rio Negro, n. 3089 of the same collector". TYPE: BRAZIL. Bahia: Gentio do Ouro, Serra do Assuruá, 1838, *J.S.Blanchet 2926* (lectotype, here designated: K[001067923]!, isolectotypes: BM!, P[00733608], other specimens cited in the protologue: BRAZIL, Bahia: Ilhéus, 1839, *J.S.Blanchet 3089,* B†[foto F neg. 13073], BM!, BM[bis]!, BR[0000008574282], K[001067924]!, P[00733605]!, P[00733606]!, P[00733607]!, W[1889-0121425]!). Fig. 7

Scandent shrub, branches tomentose to velutine. **Leaves** chartaceous; petiole 0.4–1 cm long., velutine; blade 2.5–5.4 × 1.4–2.8 cm, elliptic to oblong, apex rounded, emarginate, not mucronate, base acute, obtuse or rounded, margin not revolute, adaxial surface tomentose near the main vein, abaxial surface velutine to velutine in both surfaces. **Panicles** congested, main axis straight, tomentose to velutine; racemes capitated. **Flowers** 7–8.5 mm long., bracts e bracteoles subequal 0.9–1.1 × 1 mm, ovate, apex rounded, puberulous in central portion in both surfaces. Pedicellate; pedicel 1–1.5(2 mm in fruitification) mm, long., puberulous to tomentose, external sepals 2.1–3 × 2–3 mm, ovate, apex rounded, mucronate in dorsal surface, pubescent in both surfaces, ciliated, internal sepals 4.5–5 × 2.8–3 mm, obovate to oblong, apex obtuse, mucronate in dorsal surface, glabrous on both surfaces, ciliated in base; keel 4.7–4.5 × 2 mm, glabrous on both surfaces; not clawed; lateral petals 4.5 × 2 mm, spatulate, symmetrical, apex rounded e wided, glabrous in dorsal surface, pubescent in median portion in ventral surface, not ciliated; filament sheath 3 × 1.5 mm, externally puberulous in the apex, internally glabrous, free filaments ca. 2 mm long., glabrous; style ca. 2.5 mm long., straight, pubescent in the basal portion; ovary 1.5 × 1 mm, oblong, pubescent, without ring of trichomes in the base. **Capsule** 15–21 × 5–6 mm, obovate, apex rounded, not emarginate, puberulous.

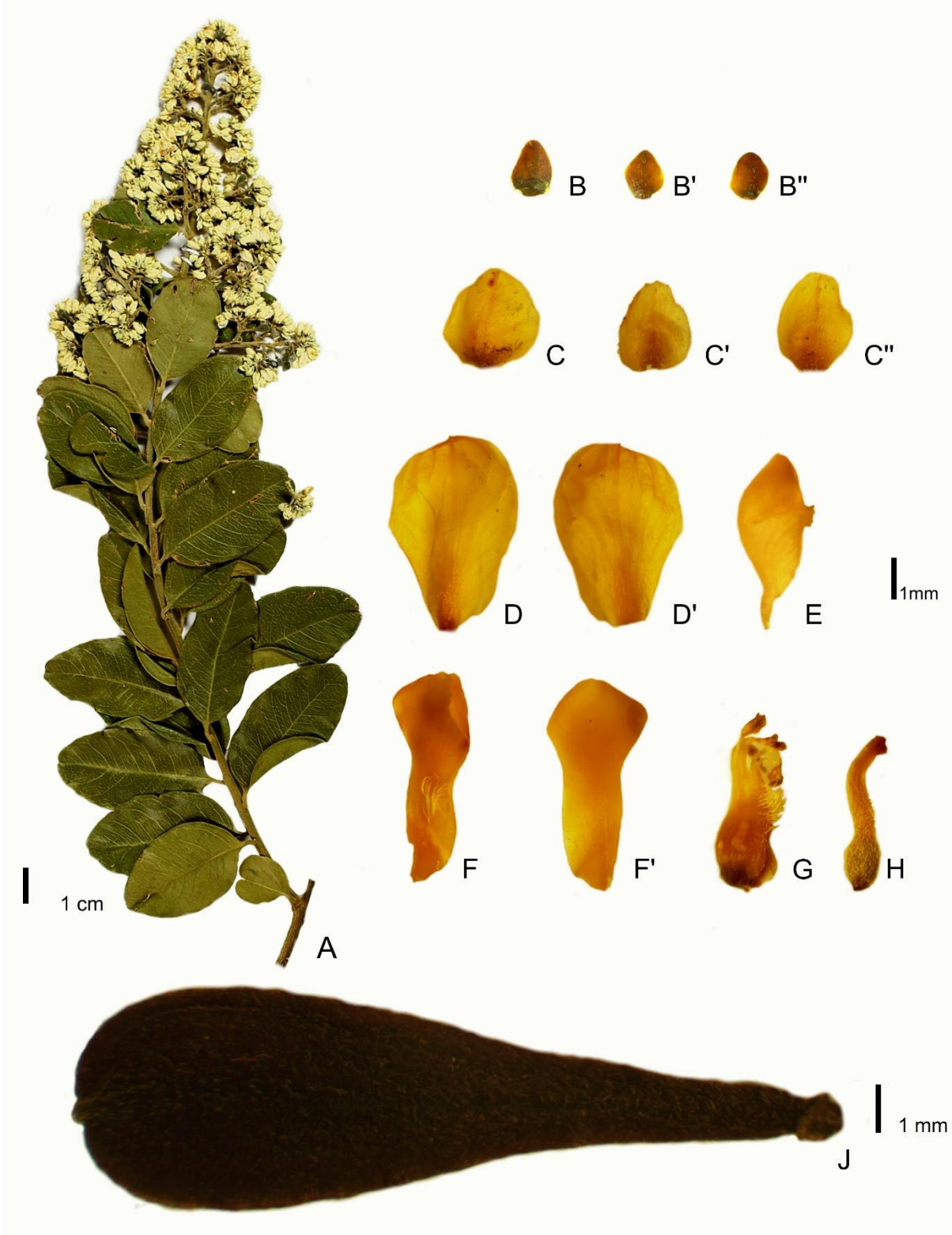


FIG. 7. *Bredemeyera brevifolia* (Benth.) A.W.Benn. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium; J. Capsule. (A. *M.L. Guedes et al. 24221* (ALCB); B-J. *G. Hatschbach et al. 78405* (CTBS)).

***Distribuition*—**The distribution pattern of *Bredemeyera brevifolia* follows the distribution of the Neotropical Dry Forest with distribution that fits in the two upper levels: 'Caatinga' and 'Central Brazil' as described by Dryflor (2016). Fig. 4

***Conservation status*—**With occurrence extension (EOO) de 1.626.991 km², and area occupancy (AOO) de 168 km^2, the specie was classified as "Least concern" (LC), because it does not fit any IUCN (2017) criteria.

***Taxonomic notes*—**Bennet (1874) cites, after describe *B. brevifolia*, '*Comesperma pubescens* Gardner' (nomen nudum), this 'name' appears in Gardner's manuscript (transcription provided by Hind 2012) for some of his collections in Ceará (n. 1919 in 'Barra do Jardim', herb K). The locality of Barra do Jardim (not to be confused with the municipality of Barra do Jardim in the state of Pernambuco) refers to the Municipality of Jardim in Ceará formerly known as Barra do Jardim until September 3, 1879 according to data from the IBGE (1960).

Marques (1980) cites the Blanchet 2926 and 3089 specimens as syntipes, both in the P herbarium, and as isosyntipes their duplicates in G and C herbarium. However, there is no evidence to treat the Blanchet specimens in P herbarium as lectotypes because none were found identification of Bentham in specimens, as well P is not the herbarium where Bentham worked. The specimen here chosen as lectotype, was certainly the material used for the description of *C. brevifolia*, was identified by Bentham (K [001067923]). Curiously, this specimen (the lectotype) divides the sheet with a specimen of *B. barbeyana* (Gardner 2777), both duly identified.

***Specimens Examined*—Bolivia.—**CHIQUITOS: Santa Cruz, Camino de Roboré a Fortin Ravelo. A 86, 2 km S de Roboré, 18º47'52"S, 60º14'21"W, 6 Fev 2005, *V.S. Neffa et al. 1901* (CTES**)**. **Brazil.—**BAHIA: Anagé, 14º48'40"S, 40º58'26"W, 8 Aug 2005, *F. França et al.* 5292 (HUEFS); Barra do Mendes, à 26 km de Barra de Mendes, 11º48'S, 42º3'W, 27 Jan 2001, *M.L. Guedes et al. 8161* (ALCB); Boa Nova, Fazenda Cotermaia (proprietário Alipe Maia), entrada à esquerda, ca. 1.2 Km E de Boa Nova, na entrada para Dario Meira, 14º22'25"S, 40º11'15"W, 8 Mar 2003, *P. Fiaschi et al. 1431* (CEPEC, HUEFS, NY); Caetité, 24 km de Paramirim na rodovia Paramirim-Caetité, 13º40'14"S, 42º18'00"W, 19 Apr 2001, *T.R.S. Silva et al. 107* (ALCB, HUEFS); Carinhanha, rodovia para Cocos, 13 km W da cidade, 14º13'45"S, 43º52'1"W, 16 Apr 2001, *J.G. Jardim et al. 3558* (CEPEC, RB); Contendas do Sincorá, estrada vincinal de Contenda do Sincorá para Palmeiras, 13º49'21"S, 41º06'54"W, *L.Y.S. Aona 3949* (HUEFS, HURB); Crisópolis, Fazenda Jequitibá, 29 Nov 2011, *A.M. Miranda & J. Ferraz 6447* (HUEFS, HST); Feira da Mata, próximo ao Rio Carinhanha, 14º13'54"S, 44º12'45"W, 27 May 2007, *M.L. Guedes et al. 13455* (ALCB); Formosa do Rio Preto, ca. 1 km do Córrego Riachão,

Fazenda Estrondo, 10 Nov 1997, *R.C. mendonça et al. 3257* (IBGE, RB); Gentio do Ouro, 1838, *J.S.Blanchet 2926* (K, BM, P); Ibicoara, Chapada Diamantina, Jun 1973, *G.C.P. Pinto s.n.* (ALCB); Jacobina, Cachoeira do Anibal, 11º12’04, 40º29’45”W, 29 Mar 1996, *M.L. Guedes 2637* (ALCB, HUEFS); Lençois, Chapada diamantina, Assentamento Rio Bonito, área de reserva, 12º20’24”S, 41º10’48”W, 3 Jun 2001, *D.M. Loureiro et al. 190* (ALCB); Licínio de Almeida, Serra Geral, Lagoa da Vereda, 14º34’11”S, 42º27’59”W, 11 Dec 2009, *F.S. Gomes et al. 400* (ALCB); Morro do Chapéu, estrada para o Morrão, 1º35’7”S, 41º11’35”W, 3 Dec 2003, *E.B. Miranda et al. 584* (HUEFS); Mulungu do Morro, Estrada Várzea do Cerco para Mulungu do Morro, 11º55'01”S, 41º28'04”W, 20 Mar 2014, *H.A. Ogasawara 388* (ALCB, RB); Piatã, Chapada Diamantina, 13º14’43”S, 41º45’28”W, 24 Mar 2005, *M.L. Guedes et al. 11529* (ALCB); Rio de Contas, estrada de terra para o morro da Igreja, 27 Fev 2018, *M. Mota & J.F.B. Pastore 164* (CTBS); Ruy Barbosa, Serra do Orobó, encosta da Serra, 12º18’35”S, 40º29’3”W, 4 Sep 2004, *L.P. Queiroz et al. 9490* (HUEFS); Saúde, 14 Dec Vitória da Conquista, 19 Jan 1984, *G. Hatschbach 47361* (MBM, RB); Umburanas, Serra do Curral Feio (localmente referida como Serra da Empreitada), entrando para W a cerca de 20 km S de Delfino na estrada para Umuranas, 10º22’S, 41º19’W, 10 Apr 1999, *L.P. Queiroz et al. 5252* (HUEFS); Upupiara, caminho para as Pintadas, 11º49’S, 42º69’W, 12 Aug 2017, *M.L. Guedes et al. 25900* (ALCB, RB).—CEARÁ: Barbalha, Chapada do Araripe, 39º20'51,9"S, 7º22'58,8”W, 28 Apr 2009, *J.R. Maciel et al. 1044* (HUEFS, VASF); Crato, Chapada do Araripe, 3 Jul 2015, *M.O. Santos 10678* (HCDAL, RB); Missão Velha, Fazenda Genipapeiro, 7º10’34”S, 39º35’5”W, 19 Aug 2011, *E. Melo et al. 10362* (HUEFS); Santana do Cariri, Cancelão, APA da chapada do Araripe, 7º12‘32”S, 39º35’48”W, 27 Oct 2010, *I.M. de Andrade et al. 4016* (HUEFS); São Benedito, Serra da Ibiapaba, 5 Jan 1942, *P. Bezerra 342* (EAC); São Gonçalo do Amarante, Pecém, 31 Oct 2007, *M.F. Moro et al. 269* (EAC, RB).—MINAS GERAIS: Capitão Enéas, Rod. Br 122, Faz. Caitetu, 21 Nov 2004, *G. Hatschbach et al. 78405* (CTBS, MBM); Francisco Sá, km 23 da Br 251 Montes Claros-Francisco Sá, 7 Nov 1984, *A.C. Allem 2878* (CEN, RB); Itinga, 18 Fev 1989, *G, Hatschbach et al. 52688* (MBM, UPCB); Januária, Vale do Peruaçu, 21 Aug 2007, *A. Salino & L.C.N. Melo 3708 (*BHCB, HUEFS); Rio Pardo de Minas, 15º26’32”S, 42º26’29”W, 8 Nov 2006, *A.C. Sevilha et al. 4842* (CEN).—PERNAMBUCO: Exu, Chapada do Araripe, Serra das abelhas, 16 Fev 2013, *M.E. Saraiva 81* (HUEFS, HST).—PIAUÍ: Caracol, ladeira de terra próximo à guarita, 202040105, 23L 0672491,25 Apr 2007, *R. Barros et al. 3024* (HUEFS, TEPB). **Paraguay.**—ALTO PARAGUAY: Bahia Negra y cercanias, 19º46'54,6”S, 58º51'42,2”W, 2 Dec 2002, *F. Meireles et al. 9061* (CTES); Chaco, Parque Nacional Defesonres del Chaco, Cerro León, 20º21'S, 60º20'W, 8 Aug 1983, *W. Hahn 1567* (MBM, MO).

BREDEMEYERA CUNEATA Klotzsch *ex* Hassk., Ann. Mus. Bot. Lugduno-Batavi 1: 188. 1864. "Hab. Guiana anglica: R. Schomburgk n. 803". TYPE: BRAZIL. Roraima: Uiramutã, Sep 1842, *R.H.Schomburgk & R.M.Schomburgk 504/803* (lectoype, perhaps the holotype: L[0537701], isolectotypes: B†[foto F neg.13077], BR[0000008574312], CGE!, G[00440292]!, G[00440293]!, L[0537702], L[2159256], P[00733612]!, W[0000839]!). Fig. 8

Scandent shrub, branches tomentose. **Leaves** chartaceous; petiole 3–6 mm long., tomentose; blade 3.9–6.8 × 1.2–2.1, flowered specimens 3.9–6.8 × 1.2–2.1, specimens with fruits 2.1–3.8 × 1.3–3.2 cm, obovate to elliptic, apex acute to acute, rarely rounded, not mucronate, base acute, margin not revolute, adaxial surface glabrous, abaxial surface puberulous. **Panicles** congested, main axis straight, tomentose; racemes capitated. **Flowers** 2.8–3 mm long., bracts e bracteoles subequal 0.6–1 × 0.2–0.3 mm, triangulares to linear, apex acute, densely pubescent in dorsal surface, puberulous in ventral surface. Pedicellate; pedicel ca. 1 mm, long., pubescent, external sepals 1–1.1 × 0.8–1 mm, ovate to oblong, apex rounded, not mucronate, puberulous in dorsal surface, glabrous in ventral surface, ciliated, internal sepals 2.2 × 1.8 mm, oblong, apex truncate to rounded, not mucronate in dorsal surface, sparsely puberulous in dorsal surface, glabrous in ventral surface, ciliated in base; keel (excluding claw) 1.5 × 1.3 mm, glabrous on both surfaces; claw 0.7 mm long., ciliated; lateral petals 1.6 x 1 mm, slightly constricted above the median portion, asymmetrical, apex rounded, not wided, glabrous on both surfaces, ciliated in the lateral margins; filament sheath 1.2 × 1–1.4 mm, externally puberulous in the apex, internally glabrous, free filaments ca. 0.5 mm long., glabrous; style ca. 1.4 mm long., arched, puberulous in the basal portion; ovary 0.8 × 0.6 mm, oblong, glabrous, without ring of trichomes in the base. **Capsule** 13.1 × 5.2 mm, obovate, apex rounded, emarginate, glabrous.

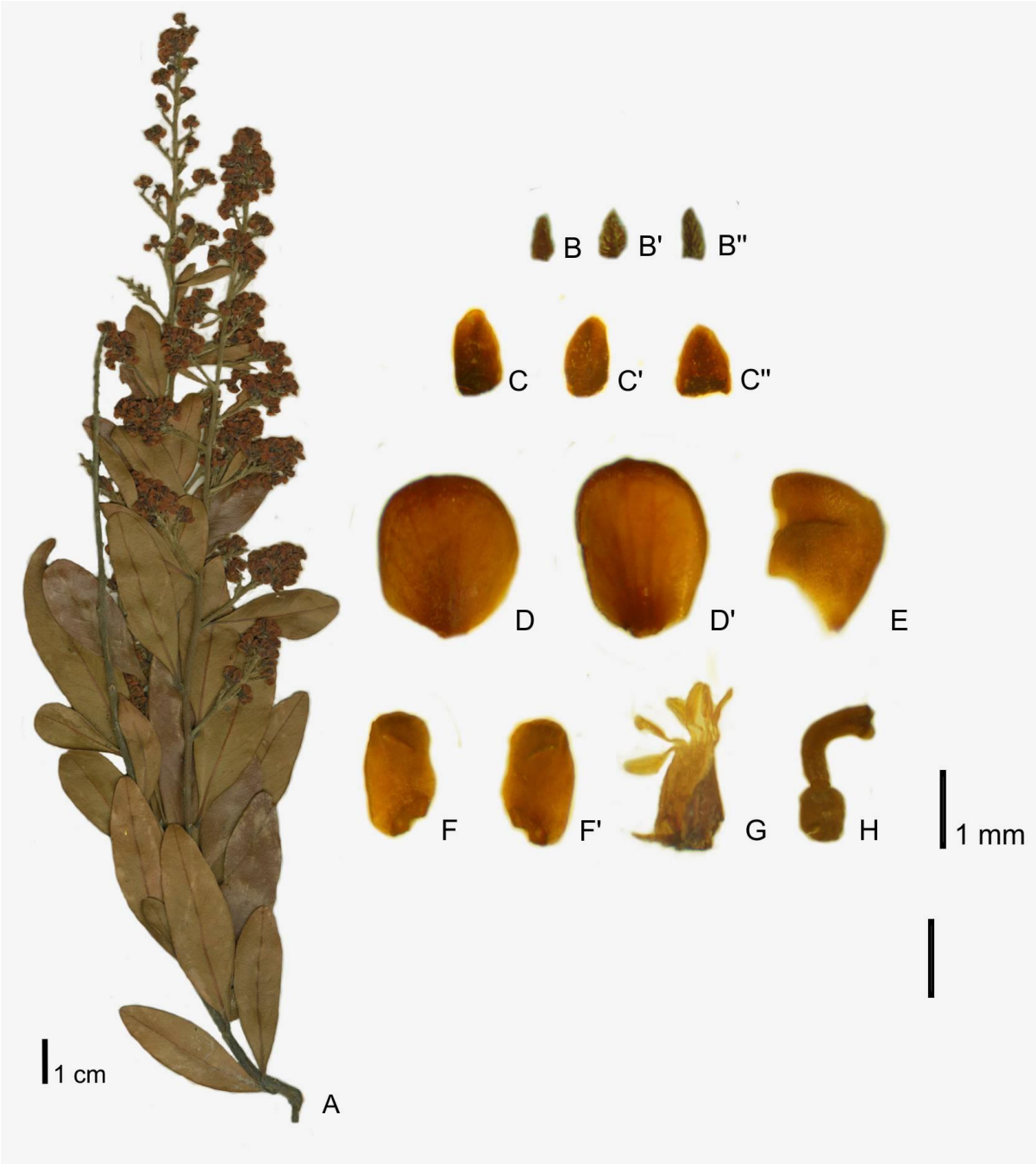


FIG. 8. *Bredemeyera cuneata* Klozsch ex Hassk. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium; J. Capsule (*R.H. Schomburgk & M.R. Schomburgk 504/803* (NY)).

Distribuition—*Bredemeyera cuneata* occurs in north of Roraima state, near the boundary with Guyana. Fig. 9

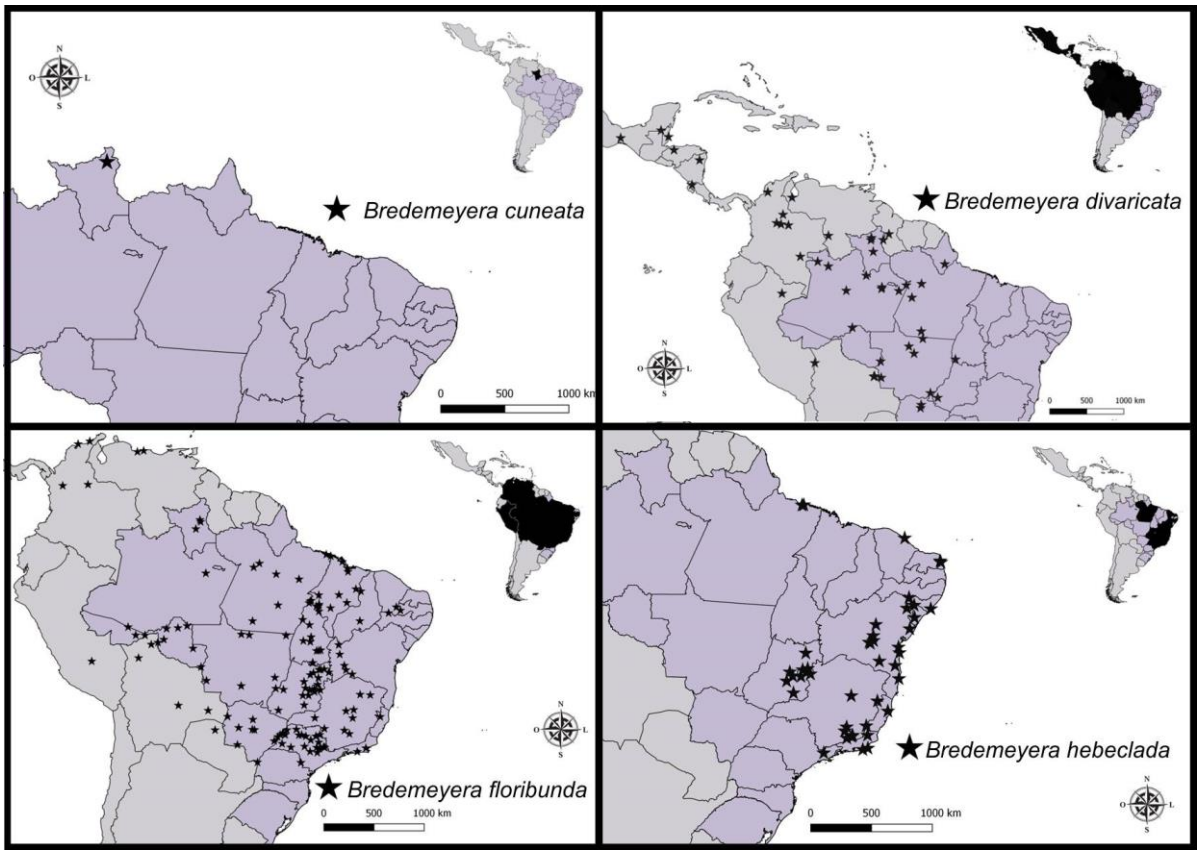


FIG. 9. Distribuition map of *Bredemeyera cuneata* Klozsch ex Hassk., *Bredemeyera divaricata* (DC.) J.F.B.Pastore, *Bredemeyera floribunda* Willd. and *Bredemeyera hebeclada* (DC.) J.F.B.Pastore

***Conservation status*—**Although *B. cuneata* is known only for a single specimen collected in the mid-nineteenth century, the lack of available data on both the region of occurrence and its distribution does not allow the classification of this species according to the IUCN criteria, in DD (insufficient data).

Taxonomic notes*—Bredemeyera cuneata* was first mentioned by Klotzsch (1849), but with the description "windender strauch" - taken from Schomburgk's original field notes - the same description used for the other previously unknown species cited in this same Klotzsch (1849), article. Thus it is considered that these descriptions are not diagnostic and thus insufficient to validate the names described in this publication according to the article 33 (Turland et al., 2018), these names were then validly published by Hasskarl (1864).

Bredemeyera cuneata was treated until the present work as the only species in the genus *Bredemeyera* with no occurrence in Brazil, and was not included in the review of Marques (1980) for its revision of the Brazilian species of the genus. However, revising the original locality, we concluded that it is located in the Brazilian state of Roraima. although the inaccurate locality present in the original labels "Guyana angl.", Riviére (2006) indicates as the original locality the low region of the Cotingo River. This locality, in the time when the plant was collected, 1842, was in dispute between Brazil and England, in the Pirara river dispute (1829-

1904) and in the decision of 1904 by the Italian king referee Vittorio Emanuel III, finally, this portion of the litigation was then assigned to Brazil (Menck, 2009, Oliveira & Magalhães 2012). According to Van Dam (2002), in the collection season of *B. cuneata* (September 1842) the expedition was being carried out by Robert H. Schomburgk and Richard M. Schomburgk, suggesting that the Schomburgk 504/803 collections are the same, because they have the same date of collection and locality (Roraima, Guyana Angl.).

In the L herbarium, where Hasskarl worked (TLII - available at http://www.sil.si.edu/DigitalCollections/tl-2/search.cfm), the material chosen as a lectotype can be found, there's two specimens *R.H. Schomburgk 803*, the L [0537701], presents the identification made by Hasskarl, demonstrating that the author used it in the description of the species. No more collection records of the species were found, in addition to the type collection.

The type collection of *Bredemeyera cuneata*, Schomburgk is probably formed by two distinct species mounted side by side on specimens K (000118446), P (00733610), P (00733612). One species, species 1, is represented by flowering branches with only one specimen with only one capsule (K000118446). On the other hand, species 2 is represented by fruit branches with only one of them (P00733612) with two remaining flowers. These species can be differentiated by: species 1 (flowering branches): Narrow-elliptic leaves, 3.9-6.8 x 1.2-2.1 cm; leafy panicles (with conspicuous foliate bracts), flower 3,43-3,65 mm, fruit 13,1 x 5,2 mm long. (vs. oblong-elliptic leaves, sometimes slightly obovate, 2.1-4.9 x 1.3-2.6 cm, non-leafy panicles or sparsely leaves (1 or 2 foliaceous bracts); fruits 8,3-9,8 x 3,1-4 mm wide present in the species 2). Thus, a flowering branch (species 1) is chosen as a lectotype.

Morphological data suggest that species "2" is a specimen of *Bredemeyera divaricata*, a species widely distributed in Amazonia and reasonably morphologically variable. However, more studies will be needed to evaluate the identity of specimens with fruit branches that accompany the *Bredemeyera cuneata* type collection. Thus, the data of the description of *Bredemeyera cuneata* consider only the specimen with flowering branches.

***Specimens Examined*—Brazil.—**RORAIMA: Uiramutã, *R.H. Schomburgk 504* (NY, K).

BREDEMEYERA DIVARICATA (DC.) J.F.B.Pastore, Phytotaxa 175(1): 59. 2014. *Badiera divaricata* DC, Prodr. [A. P. de Candolle] 1: 335. 1824. "in Para Amer. Merid. An hujus generis? v.s. in h. Mus. Par." TYPE: BRAZIL. Pará: Oct 1783–Jan 1792, *A.R.Ferreira s.n.* (lectotype, designated in Pastore (2014): P[00697589]!, isolectotype: P[00303393]!). Fig. 10

Catocoma lucida Benth., J. Bot. (Hooker) 4: 101. 1842. "Dry savannahs, Pirara; Schomhurgk, n. 717". *Bredemeyera lucida* (Benth.) Klotzsch ex Schomb., Reis. Br.-Guiana [Ri. Schomburgk] 3: 1182. 1849. TYPE: GUYANA. Pirara: 1839, *R.H.Schomburgk 717* (lectotype, here designated: K[000118445], isolectotypes: BM[000027072]!, BR[0000008574770], CGE!, CGE[bis]!, CGE[bis]!, G[00440290]!, G[00440291]!, K[000118458]!, L[0537703], P[00733625]!, P[00733626]!, TCD[0003658], W[0000838]!, W[1889-0108363]!). *syn. nov.*

Catocoma altissima Poeppig, Nov. Gen. Sp. Pl. (Poeppig) 3(7-10). 65. t. 273. 1845. *Bredemeyera altissima* (Poepp.) A.W.Benn., Fl. Bras. 13(3): 50. 1874. "Crescit in sylvis primaevis circum Ega". TYPE: BRAZIL. Amazonas: Tefé, 1832, *E.F.Poeppig 2901* (lectotype, here designated: W[0048633], isolectotypes: B†[foto F neg. 13072], BM!, MO[1778744], P[00733593]!, P[00733594]!, W[1889-0214802]!).

Bredemeyera altissima var. *emarginata* A.W.Benn., Fl. Bras. 13(3): 50. 1874. "ad ripas fluv. Atabapo". TYPE: COLOMBIA. Jun 1854, *R.Spruce 3721* (lectotype, designated in Pastore (2014): K[000263980]!, isolectotypes: BR[8574138], CGE, K[000263981]!, P[733592]!).

Catocoma mollis Triana & Planch., Ann. Sci. Nat., Bot. sér. 4, 17: 133. 1862. *Bredemeyera altissima* var. *mollis* (Triana & Planch.) A.W.Benn., Fl. Bras. (Martius) 13(3): 50. 1874. *Bredemeyera mollis* (Tr. & Pl.) Dugand, Caldasia iii. 37 (1944). "Près d'Anapoima et de Pandi, vallée du Magdalena, alt. 400-1200 mètres (Tr.)". TYPE: COLOMBIA. Bogotá: Madalena, 1 Mar 1955, *J.Triana 5647* (lectotype, designated in Dugand (1944): COL[000002030], isolectotypes: BR[0000008574206], K[000591153]!, P[00733591]!).

Bredemeyera isabelliana Barb.Rodr., Vellosia 1: 5. 1888. "Hab. In prov. Amazonas in sylvis inundatis, prope Manáos, olim Barra do rio Negro. Flor in Jan". TYPE: BRAZIL. Amazonas: Manaus (lectotype, here designated, Vellozia 1: Tab 4A (1888) [*Bredemeyera isabelliana*].

Bredemeyera altissima var. *amazonica ex* J.F.Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 13: 908. 1950. "In herb., differt foliis elliptico-lanceolatis minoribus. Loreto: Mishuyacu near Iquitos, Klug 405, type, var.; also 1547. Brasil". TYPE: *PERU. Loreto*: *Iquitos, Oct 1929-Nov 1929, G.Klug 405* (sintype: NY[399985]). *syn. nov.*

Scandent shrub, branches pubescent to tomentose. **Leaves** chartaceous; petiole 4–9 mm long., puberulous to pubescent; blade 3.7–11.5 × 2–5.5 cm, elliptic, apex acute, acute-emarginate to slightly acuminate, mucronate, base obtuse to rounded, margin not revolute, glabrous to puberulous in the main vein in both surfaces. **Panicles** lax, main axis straight,

tomentose; racemes triangular. **Flowers** 4–7.5 mm long., bracts e bracteoles subequal 1–1.2 × 0.4–0.6 mm, triangulares, apex acute, densely pubescent in dorsal surface, puberulous in ventral surface. Pedicellate; pedicel 1–2.5 mm, long., tomentose, external sepals 1.7–2 × 1–1.5 mm, ovate, apex rounded, not mucronate, puberulous to pubescents in dorsal surface, puberulous to glabrous in ventral surface, ciliated, internal sepals 3–3.5 × 2–2.5 mm, oblong, apex rounded, mucronate in dorsal surface, pubescent in dorsal surface, densely pubescent in ventral surface, to both surfaces puberulous in median portion, ciliated; keel (excluding claw) 2–2.4 × 1.6–2 mm, puberulous to pubescent in dorsal surface (central); claw 0.4–0.6 mm long., glabrous; lateral petals 2.1–2.6 × 1.3–1.5 mm, constricted above the median portion, asymmetrical, apex rounded, not wided, glabrous in dorsal surface, puberulous in ventral surface to puberulous in the median portion in both surfaces, ciliated; filament sheath 1.7–1.8 × 1.5–2 mm, externally pubescent in the apex, margins and median portion, internally glabrous, free filaments 0.8–1.2 mm long., glabrous; style 1.6–2 mm long., arched, puberulous to densely pubescent in the basal portion; ovary 0.9–1 × 0.6–0.7 mm, oblong, glabrous, without ring of trichomes in the base. **Capsule** 10.5–12 × 0.5–0.6 mm, obovate, apex rounded, emarginate, glabrous.

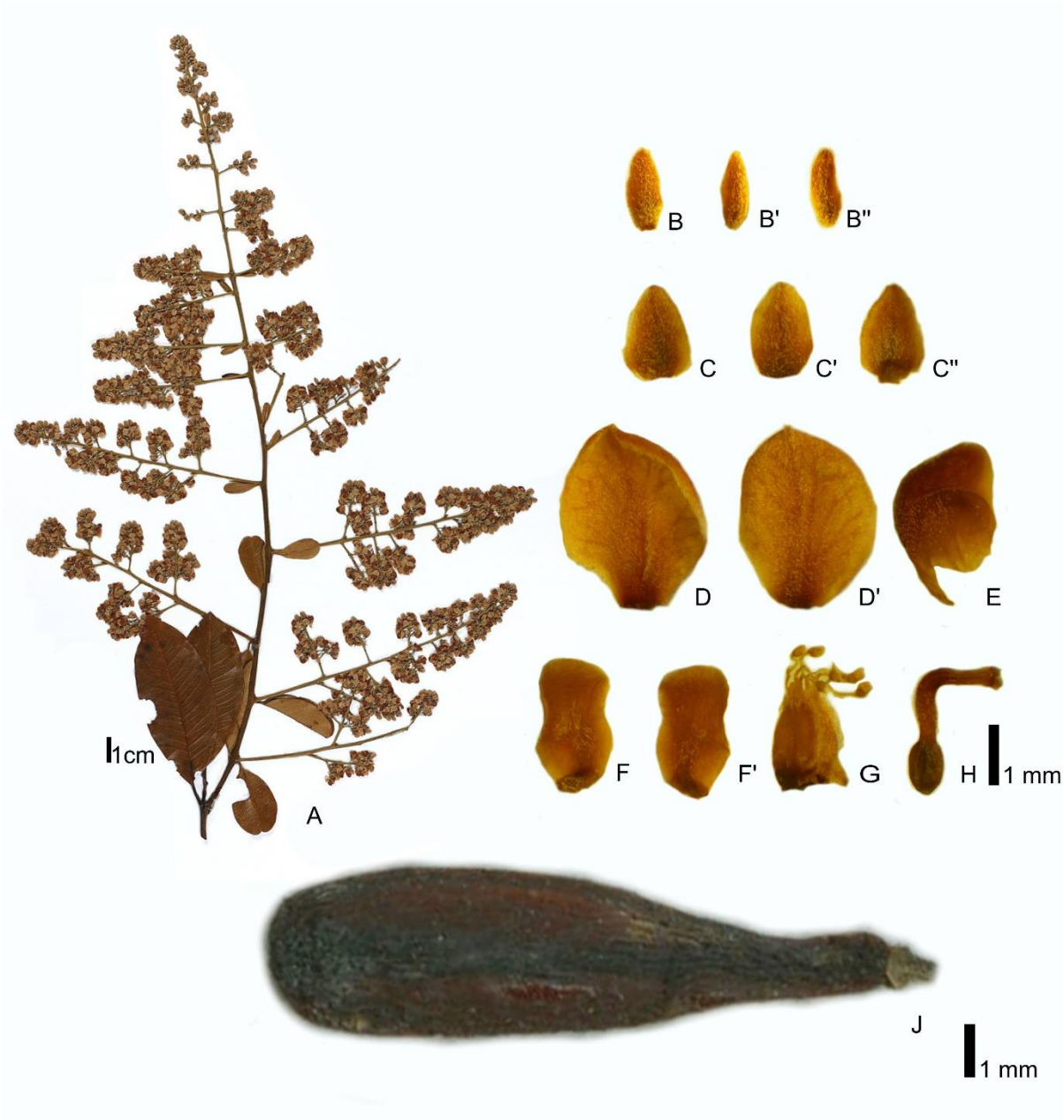


FIG. 10. *Bredemeyera divaricata* (DC.) J.F.B.Pastore. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule (A. *H.S. Irwin et al. 16885* (CEN). B–H. *L.M. Borges et al. 771* (RB) e J. *R.M. Becker 101* (RB).

Distribuition—*Bredemeyera divaricata* can be found in most of Central America, from southern Mexico to the north and center-west of Brazil. It occurs in the following countries: Belize, Bolivia, Colombia, Guyana, Nicaragua, Mexico, Trinidad and Tobago, Venezuela. According to Aymard (2004), also occurs in Guatemala, Panama, French Guyana, Ecuador. In this study the occurrence of *B. divaricata* was also discovered for Amapá, a state previously unrecorded by *Bredemeyera*. Fig. 9

***Conservation status*—**With an occurrence extension (EOO) of 8,775,828 km², the area occupancy (AOO) of 256 km2, the species was evaluated as "least concern" (LC), the especies does not fit in any criteria of the IUCN (2017) and has a wide distribution.

***Taxonomic notes*—**Marques (1980) cites as holotype (for *C. altissima*) Poeppig 2901 (W and G) and includes a photograph of W [0048633]. In the herbarium W are kept two specimens of Poeppig 2901, one of them W is here chosen as lectotype of *Catocoma altissima*, because it contains the identification and annotations of Poeppig, in addition to having apparently belonged to its main collection (annotated as' hb. Origin. Poeppigian'). Still on *Catocoma altissima*, Poeppig cites in the protologue "Crescit in sylvis primaevis circum Ega", that refers to Vila Ega, old name of the present city of Tefé (AM), modified in 1855 (IBGE, 1960).

Macbride (1950) describes *B. altissima var. amazonica* Chodat ex J.F.Macbr. for the Peruvian Flora, based on an identification of Chodat in herbarium. Macbride (1950) cites, in addition to the Klug 405 specimen, another material for Brazil (Klug 1547) in the protologue. Until this moment, the Brazilian specimen cited has not been found. *Bredemeyera altissima* var. *amazonica* Chodat ex J.F.Macbr. was here synonimized because, according to Chodat, its difference for *B. altissima*, it was the size of the leaves, considering that, through the current study it is possible to affirm that the leaves in this species vary in shape and size, even in a same specimen, thus is not possible recognize these names, not even as a variety.

Bredemeyera isabelliana had its original specimen lost, when the Barbosa Rodrigues collection was destroyed by a flood (Cribb. & Toscano-de-Brito 1996). The original illustration made by the hands of Barbosa Rodrigues himself was designated here as a lectotype according to article 9.12 of the ICN (Turland et al., 2018). An error is noted in the legend of Table IV (the lectotype) which inverts the names "*Securidaca rosea"* and *"Bredemeyera isabelliana".*

Marques (1980) effectively lectotipified *Catocoma lucida*, according to article 9.23 of the ICN (Turland et al., 2018), for designate a material as a "holotype" (even without using the term "lectotype") for the specimen Schomburgk 717 (P). In the Paris Herbarium two specimens of R.H.Schomburgk 717 P and P [00733626] are kept, the photograph of the second is included in Marques (1980). However, there is no evidence that Bentham examined any of the specimens of the P herbarium to describe *Catocoma lucida* (isosyntypes). On the other hand, the R.H.Schomburgk 717 specimen held in K [000118445] has evidence that it was verified by Bentham and used for the diagnosis (syntypes), thus the latter specimen being the one here chosen as the new lectotype, based on Article 9.19 (Turland et al., 2018).

The combination of *C. lucida* in *Bredemeyera lucida* (Benth.) Klotzsch. ex Hassk. had its authorship erroneously attributed to the Hasskarl (1864). However, by the priority of Klotzsch's

work (1849), although no basionym indication (in *Catocoma lucida*) according to article 41.3 of the ICN (Turland et al., 2018) before January 1, 1953, an indirect reference is sufficient for valid publication of a new combination, so the correct name of the combination is *Bredemeyera lucida* (Benth.) Klotzsch.

Bennet (1874) cites as synonyms of *B. lucida*, *Catocoma mansonii* Klotzsch, *Bredemeyera mansonii* Klotzsch and *Comesperma mansonii* Lhotsky ex Klotzsch, 'names' never validly published (*nomina nuda*). Besides these, there is another nomem *nudum nudum* created by Bennett, the specimen deposited in the NY herbarium collected by O. Kuntze s.n., is identified as *B. laurina*, which is *B. divaricata*.

Bredemeyera lucida and *B. altissima* were historically treated as distinct species, by Marques (1980) also found some morphologically intermediate specimens, the autor referred to possible hybrids with atrophied seeds. However, here it was not possible to separate these entities recognized by Marques (1980), even as an infra-specific category, being treated here as a species of wide distribution and reasonable morphological variability (Fig. 11), although it is easily distinguishable from other species of the genus.

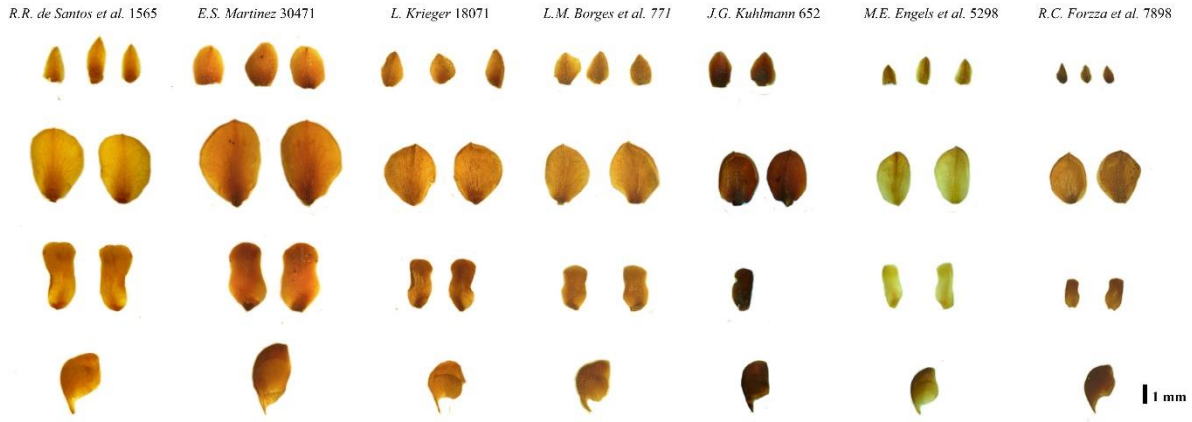


FIG. 11. Morphological variation in *Bredemeyera divaricata* (DC.) J.F.B.Pastore

***Specimens Examined*—Belize.**—STANN CREEK: 17º03’22”N, 88º19’30”W, 21 Dec 2005, *Abbott & Carlsward 19637* (MO). **Bolivia.**—SANTA CRUZ: Velasco, Campamento El Refugio a 2500m al norte de la casa yendo hacia la bahia Las Petas, em um bosque ribereño, 14º45'44"S, 61º02'53”W, 18 May 1994, *R. Guillén & S. Coria 1363* (MBM, MO). **Brazil.**—ACRE: Cruzeiro do Sul, Igarapé Humaitá, afluente da margem direita do Rio Juruá, atrás da colocação Dois Portos, 08º19'S, 72º47'W, 27 Oct 1991, *C.A. Cid Ferreira et al. 10415* (NY).—AMAPÁ: Camaipi, Embrapa reserve and vicinity, 0º10'N, 51º37'W, 9 Sep 1983, *S. Mori et al 15991* (MG, NY, US).—AMAZONAS: Barcelos, margens do Rio Negro, 1º21'16"S,

62º03'33”W, 15 Apr 2014, *R.C.Forzza et al. 7898* (CEPEC, RB, UPCB); Barcelos, matas de amabas as margens do rio Aracá, perto do rio Jauari, 00º30'N, 68º30'W, 1 Jul 1985, *E. Sette Silva et al. 182* (INPA, NY, MPEG); Barreirinha, margem direita do paraná Maçauarí, 25 May 1974, *F. Mello s.n.* (INPA, RB); Borba, margem do Rio Acarí, margem do Rio Cipó, 21 Mar 1960, *W. Rodrigues 1567* (INPA, RB); Manaus, Ilha da Marantaria - Rio Solimões, folha SA.21-Y-A, 28 Jan 1984, *G.C. Pereira Pinto 27/84* (IBGE, MBM); Manaus, Reserva Florestal Ducke, Manaus- Iticoatiara, km 26, próximo ao acampamento do Acará, 02º53'S, 59º58'W, *A. Vicentini et al. 705* (INPA, K, MBM, MG, MO, NY, RB, SP); Manaus, Road Manaus (Cacau-Pireira) to Manacapuru, km 25, 3 Jan 1967*, G.T. Prance et al. 3890* (IAN, NY, UB); Maués, Rio Parauari, 1 Fev 1979, *D.F. Coelho & J. Lima 396* (INPA); Nova Olinda do Norte, Lower Rio Mari Mari, below Rio Para, Laranjal, 1 Jul 1983, *C. Todzia et al. 2291* (INPA, MG, NY); Novo Airão, Barranca do Rio Negro, em frente ao Forúm da Justiça, 14 Jan 2009, *V.F. Kinepp et al. 3521* (EAFM, UB); Parintins, 12 Sep 1947, *J.M. Pires & N.T. Silva 1209* (IAN, UB); Santa Izabel do Rio Negro, Margem da Baía Buiuçu, 18 Mar 1969, *J. Elias et al. 483* (UB); Santa Izabel do Rio Negro, próximo ao Rio Arara, 27 Apr 1973, *A. Loureiro et al. s/n* (INPA, MBM); São Gabriel da Cachoeira, São Felipe, Rio Içana, 17 Mar 1952, *R.L. Fróes 27874* (IAN, UB); São Gabriel da Cachoeira, Taracuá, margem do Rio Uaupés, bacia do alto Rio Negro, 1 Junho 1962, *J.M. Pires & N.T. Silva 7919* (IAN, UB); Tefé, 10 Jul 1979, *L. Krieger & M. Sabino 16292* (CESJ); Tefé, 18 Fev 1981, *L. Krieger s/n* (CESJ).—GOIÁS: Rio Araguaia, Barreira de Campos, 18 Aug 1978, *N.T. Silva 4853* (NY, INPA, MG).—MATO GROSSO: Alto do Garças, 22 Jul 1974, *G. Hatschbach 34697* (MBM); Nova Xavantina, Base Camp of the Expedition, 12º54'S, 51º52'W, 29 Jun 1968, *J.A. Ratter et al. s/n* (UB); Cáceres, Jun 1911, *F.C. Hoehne 4058* (R); Comodoro, 13º44’32”S, 60º21’30”W, 26 Apr 2012, *E.C. Antunes & L.L Antunes 305* (RB, UB); Cuiabá, 16 Jun 1902, *G.O.A. Malme 1750* (US); Diamantino, Oct 1979, *J.R. Pirani 1079* (SPF); Nobres, road to Fazenda Santana, 9,6 km S of Rio Celeste (ca 61 km S of Sinop) then 1.5-4 km E on road to Fazenda Santana, 12º23’S, 55º37’W, 19 Sep 1985, *W. Thomas et al. 3901* (INPA, MG, NY); Pontes e lacerda, Furnas de Sararé, 15º27’S, 58º38’W, 24 Jul 1978, *R. Becker Filho 65* (RB); São Félix do Araguaia, 24 Jul 1968, *P.W. Richards 6506* (RB); Sinop, Km 2 of Rio Teles Pires on road from Br163 to Porto dos Gaúchos (MT 220), 11º42'S, 55º42'W, 22 Sep 1985, *W. Thomas et al. 3958* (INPA, MG, NY); Tariporã, ca. 50 km N (em Linha reta) de Tabaporã, 10º45'S, 56º23'W, 21 Apr 1997, *V.C. Souza et al. 15347* (ESA, RB, MT); Vila Bela da Santissima Trindade, fazenda lagoa encantada na MT 246, 18 Jul 1986, *M. Emmerich et al. 5740* (R); Vila Bela da Santíssima Trindade, Serra do Ricardo Franco. Trilha para o topo da Serra rumo à Cachoeira do Jatobá a partir do Sítio do Neido, 14º54'18"S,

60º03'39”W, 19 Jun 2012, *L.M. Borges et al. 771* (CTBS, SPF).—MATO GROSSO DO SUL: Corumbá, Morro da penha na serra do Amolar, 8,5 km da vila do Amolar, 17º58’30,9”S, 59º26,27’1”W, 20 Oct 2002, *I.M. Bortolotto et al. 1207* (COR); Coxim, 30 Aug 1973, *G. Hatschbach 32502* (MBM); Coxim, 30 Aug 1973, *G. Hatschbach 32502* (MBM, US); Rio Verde de Mato Grosso, Rio Casca, 11 Aug 1997, *G. Hatschbach et al. 66641* (MEXU).—PARÁ: Curuá, 8º45'S, 54º45'W, Jul 2005, *M. Sobral et al. 9927* (BHCB, HUEFS); Itaituba, Missão Cururú, 9 May 1977, *N.A. Rosa & M.R. Santos 1865* (MBM, MG); Novo Progresso, Base Aérea Brig. Velloso da Serra do Cachimbo, campina a 3 km da base, 9º43’48”S, 54º32’24”W, 6 May 2007, *C.A.C. Ferreira 12863* (INPA); Oriximiná, Rio Trombetas, Lago Erepecú, Reserva Biológica do IBDF, 56º58’W, 1º25’S, 2 Jul 1980, *G. Martinelli 7370* (NY); Pau D’arco, Marajoara, 15 Aug 1998, *J. Grogan 366* (IAN, INPA); Santarém, Km 35 da estrada do Palhão, arredores do Acampamento do Igarapé, 24 Aug 1969, *M. Silva & R. Souza 2372* (MG, NY).—RONDÔNIA: Cabixi, Fazenda Félix de Lima, próximo ao Porto Félix, vegetação ciliar do Rio Guaporé, 21 Jun 2014, *H.R. Barbosa & Barbosa s.n.* (HCF); Cachoeira misericórdia, Rio madeira at Ribeirão Vine, 2 Aug 1968, *G.T. Prance et al. 6720* (INPA, NY, UK, K, MG, B, UB, UC, LE); Estrada Porto Velho-Cuiabá, Br 364, no km 171, 6 Fev 1983, *C.A.A. Freitas et al. 2* (INPA, MBM); Itapuã do Oeste, Santa Bárbara, 15 km east of km 117, 12 Aug 1968, *G.T. Prance & J.F. Ramos 6883* (INPA, RB, US); Ouro preto do Oeste, linha 22, próximo ao rio Mariape, em estrada de barro, "-10.748056, -62.215833, 15 Jul 1986, *J. Agoo et al. 1835* (R); Porto Velho, Cachoeira Samuel, 18 Aug 1963, *J.M. Pires 56723* (UB); Vilhena, arredores do Sítio Recanto dos Pássaros, 36 km de Vilhena, próximo à Br 364, 20 Jun 2014, *M.G. Caxambu et al. 5348* (HCF).—RORAIMA: Amajari, Base of Serra Tepequem, 10 Fev 1967, *G.T. Prance et al. 4276* (INPA); Caracaí, Estrada Manaus-Caracaraí (Br 174) entre kms 522 e 524, próximo à Novo Paraíso, no entroncamento com a Estrada Perimetral Norte (Br 210), 01218'N, 60235'W, 25 Aug 1987, *C.A. Cid Ferreira et al. 9175* (INPA, MBM); Ilha de Maracá, SEMA Ecological Reserve, boundary near station, E of causeway, 3º22'N, 61º26'W, 1 Apr 1987, *W. Milliken & J. Lima 44* (INPA); Mucajaí, Serrinha, Rio Mucajaí, 1 Fev 1967, *G.T. Prance et al. 4236* (NY, US).—TOCANTINS: Sandolândia, Bacia do Araguaia, sub-bacia:rio Javaés (A-3, área 1, ponto 17b), Rio Verde, Fazenda Mãe Maria, 12º28'24"S, 50º12'07”W, 12 Jul 2009, *F.C.A. Oliveira et al. 1626* (HUEFS, IBGE). **Colombia.**—BOYACÁ: Boyacá, 26 Fev 1939, *no colector* (COL).—CASANARE: El Yopal, Abr-Mai 2009, *J.M. Campos & L.F.P. Pinzón 310* (COL).—GUAINIA: Inirida, Rio Inirida, Caño Caimãn, trocha entre campamento, 7 Mar 1997, *P. Galvis & T. Agapito s/n* (COL).—SANTANDER: Los Santos, Sector Norte de La Mesa de Los Santos, 18 Sep 2004, *J.L. Fernández-Alonzo et al. 21967* (COL).—VAUPÉS:

Mitú, Río Kubiyú, a lo largo del río, 10 Jul 1975, *J.L. Zarucchi* (COL). **Guyana.—**Pirara, 1839, *R.H.Schomburgk 717* (BM, BR, CGE, G, K, L, P, TCD, W). Takutu river, Essequibo region, Rapunum area, Surama Village, 4º9'N, 59º2'W, 22 Fev 1990, *P. Acevedo-Rdgz et al. 3345* (F, INPA, US). **Mexico.—**CAMPECHE: Calakmul a 9 km al E de os Naciones, 17º54'52"N, 89º19'8"W, 2 Apr 1998, *E.S. Martinez et al. 30471* (MBM, MEXU).—OAXACA: Sta. Maria Chimalapa, Encinares chaparreras cerca de Sta. Maria, por la vereda a Arroyo Sangre, 16º54'30"N, 94º41'W, 2 Mar 1987, *G.H. Hernández 2414* (CHAPA, UNAM). **Nicaragua.—**REGIÓN AUTÓNOMA DEL ATLÁNTICO NORTE: Zelaya Along the new road between Rosita and Puerto Cabezas, ca. 15,7 km SW of Rio Kukalaya, 13º58'N, 84º12'W, 30 Apr 1978, *W.D. Stevens & B.A. Krukoff 8458* (MBM, MO). **Peru.** MADRE DE DIOS: Río Heath: Santuario Nacional de Las Pampas del Heath, lado oeste de la Pampa, pasando del campamento Aguas Claras; 5-6 km, oeste del río y Refugio Juliaca, 12º57'S, 68º53'W, 14 Jun 1992, *J.A. Castillo 6921* (F).—LORETO: Maynas Iquitos, Río Nanay, Carretera de Picuruyacu, 18 Aug 1981, *S. McDaniel & M. Rimachi 25342* (USM). **Trinidad and Tobago**.—SAINT GEORGE: Tacarigua, Mount St Benedict, about 3 kms North of Tunapuna, 10 Fev 1962, *W.H.A. Hekking 1415* (USF). **Venezuela.—**AMAZONAS**:** Santa Barbara, locally frequente at junction of Santa Barbara savana with riverine forest, at junction of rios Orinoco and Ventuari, 22 Fev 1951, *R.S. Cowan & J.J. Wurdack 32046* (NY, RB).—BOLIVAR: Rio Parguaza, below El Carmen, 24 Dec 1955, *J.J. Wurdack & J.V. Monachino 40924* (NY, R).—ZULIA: Colón, alrededores de Casigua El Cubo: sector las Cruces: unos 18 km al Sso de Casigua, cerca del pozo T-218, 20 Jan 1979, *G.S. Bunting et al. 6710* (RB).

BREDEMEYERA FLORIBUNDA Willd. Ges. Naturf. Freunde Berlin Neue Schriften**,** 3: 412. 1801. "Ein immergruner Strauch, der in der Provinz Caracas an den Randern der Walder vorkommt". TYPE: VENEZUELA. Caracas: no date, *F.Bredemeyer s.n.* (Holotype: B-W[13052010]). Fig. 12

Comesperma floribunda A.St.-Hil. & Moq., Ann. Soc. Sci. Orleans sér. 2: 56. 1828. C*atocoma floribunda* (A.St.-Hil. & Moq.) Benth., J. Bot. (Hooker) 4: 102. 1842. "Nascitur in sylvis prope tabernam Sumidoiro haud longè à vico Nossa Sñra da Conceçaò in provinciâ Minas Geraës" TYPE: BRAZIL. Minas Gerais: Conceição do Mato Dentro, 2–3 Mar 1817, *A.Saint-Hilaire Cat. B1 856* (lectotype, here designated: P[733615]!, isolectotype: P[733613]!)

Bredemeyera moritziana Klotzsch *ex* Hassk., Ann. Mus. Bot. Lugduno-Batavi 1: 188. 1864. "Hab. Merida: Moritz n. 226(?)". TYPE: VENEZUELA. Trujillo: Escuque, 1852,

J.W.K.Moritz 226 (sintypes: HBG[508628], P[00733616]!, P[00733617]!, P[00733618]!).

Bredemeyera floribunda var. *acutifolia* Chodat. “"Cordill. Peribebuy n. 4713 (flores), n. 4714 (fruct.)". TYPE: PARAGUAY. Cordillera: Piribebuy, 15 Sep de 1883, *B.Balansa* (sintypes: G!, P[02568944]!, P[02568945]!, P[02568946]!)

Bredemeyera floribunda var. *puberula* Kuntze, Revis. Gen. Pl. 3[3]: 9. 1898. “W.Ktze. Folia subtus pubescentia. Mattogrosso”. TYPE: BRAZIL. Mato Grosso: Jul 1852, C.E.O.Kuntze s.n. (lectoype, perhaps the holotype (here designated): NY[00846420]).

Bredemeyera floribunda f. *elliptica* Chodat, Bull. Herb. Boissier ser. 2,3: 57. 1902. “Frutex similis 8357, differt foliis ovatis minus tomentosis, in dumeto pr. Bellavista (Apa), 8357a”. TYPE: PARAGUAY. Bella Vista Norte, *E.Hassler 8357a.*

Bredemeyera floribunda f. *subvestita* Chodat, Bull. Herb. Boissier ser. 2,3: 57. 1902. “petala alba in dumeto in regione cursus superioris fluminis Apa. Jan., n. 8357; frutex 4 6 m., petala alba, in silvis collis Tobaty. Mart., n. 4005”. TYPE: PARAGUAY. Cordillera: Tobaty, *E.Hassler* (sintypes: MPU[012033], P[02568932]!, P[02568941]!, S[08-19552], S[08-19553]).

Scandent to erect shrub, branches puberulous to tomentose. **Leaves** chartaceous; petiole 0.4–1.2 cm long., puberulous to tomentose; blade 6(6.5)–10(12.2) × (2.2)3–4(5.8) cm, elliptic to oblong, apex acute to acuminate, sometimes mucronate, base acute to obtuse, less often, rounded, margin not revolute, adaxial surface glabrous, pubescent near the main vein, abaxial surface puberulous to pubescent, rarely glabrous. **Panicles** lax, main axis sinuose, velutine; racemes triangular. **Flowers** 9–13 mm long., bracts e bracteoles subequal 1.2–1.3 × 0.6 mm, ovate, apex acute, puberulous in dorsal surface, pubescent in ventral surface (central). Pedicellate; pedicel 1–3(3–4 in fruitification) mm, long., tomentose to velutine, external sepals 2–2.5 × 2 mm, ovate to oblong, apex obtuse, slightly mucronates, puberulous in dorsal surface, pubescent in ventral surface, ciliated, internal sepals 6.5–7 × 4–4.5 mm, oblong, apex obtuse, slightly mucronate in dorsal surface, puberulous in base in dorsal surface, pubescents in ventral surface, ciliated; keel 7 × 2.3–2.5 mm, glabrous on both surfaces; not clawed; lateral petals 5–6 × 4–5 mm, constricted above the median portion, symmetrical, apex rounded to truncate, wided, glabrous in dorsal surface, pubescent in median portion in ventral surface, ciliated in basal half; filament sheath 3.5–3.8 × 2 mm, externally pubescent in the apex, margins and median portion, internally glabrous, free filaments 1.5–2 mm long., glabrous; style 3–3.5 mm long., straight, glabrous; ovary 2–2.5 × 1 mm, obovate, densely pubescent, without ring of

trichomes in the base. **Capsule** 15–20 × 3–4 mm, obovate-oblong, apex truncate, slightly emarginate, densely pubescent.

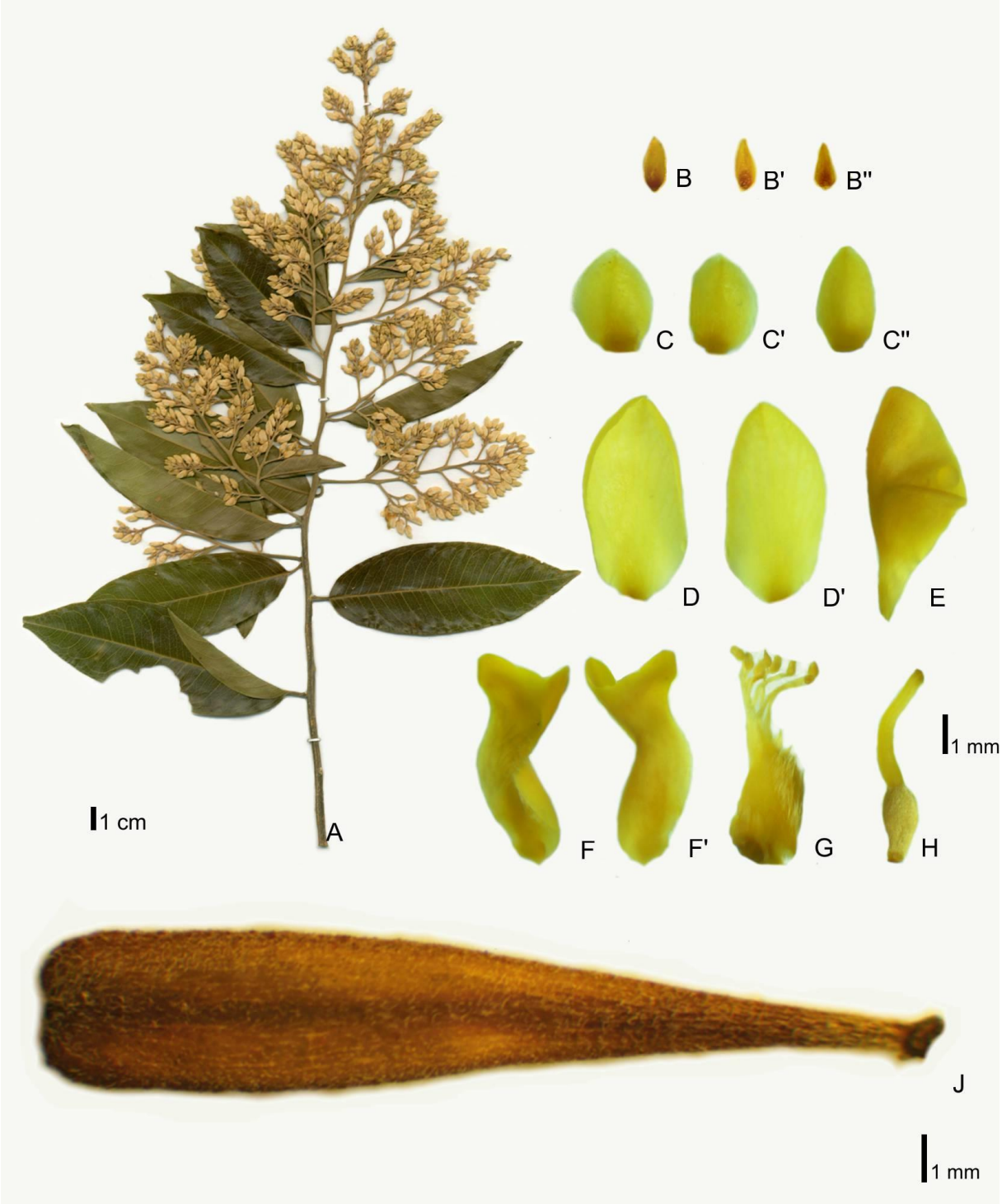


FIG. 12. *Bredemeyera floribunda* Willd. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule. A. *M.R. Pietrobom da Silva s.n.* (CTBS); B–H. *T.B. Croat 21352* (MBM) e J. *V. Demuner et al. 3000* (CTBS).

Distribuition—*Bredemeyera floribunda* occurs between Colombia and Brazil, except for the Rio Grande do Sul state, in savannah areas. Fig. 9

***Conservation status*—** Presenting occurrence extension (EOO) 10.528.524 km², and area occupancy (AOO) de 548 km^2, the species was evaluated as "Least concern" LC, the especies does not fit in any criteria of the IUCN (2017) and has a wide distribution.

***Taxonomic notes*—**The genus *Bredemeyera* and its type species *Bredemeyera floribunda* were described by Willdenow in 1801. One of the interesting facts about type (B-Willd.) is the sheet annotated as 'Humboldt'. The confusion is partly due to the shipment of some Humboldt specimens from South America to Willdenow in Berlin. After Willdenow's death in 1812, part of his herbarium was disorderly leading von Schlechtendal, in an attempt to organize the collection, erroneously attributed the holotype of *B. floribunda*, among other specimens, to the Humboldt (Rodríguez and Greuter 2001). The identity of the original specimen collector, however, can be inferred from the original paper of *Bredemeyera*, where Willdenow honored the german botanist Franz Bredemeyer the original specimen collector in Venezuela with the genus name *Bredemeyera*.

The specimens of Hassler, cited in the protologue of *Bredemeyera floribunda* f. *elliptica and Bredemeyera floribunda* f. *subvestita*, have no evidence of having been used by the author in the description of the species, possibly such material is in the G herbarium, but so far it has not been possible to analyze them.

The specimen NY[00846420] of *Bredemeyera floribunda* var. *puberula*, is possibly the holotype, since it is in the place where Kuntze worked and deposited its types (TLII - available in http://www.sil.si.edu/DigitalCollections/tl-2/search.cfm),

And was the only material found it. *Bredemeyera moritziana* was described based on material from Klotzsch by Hasskarl (1864), so the lectotipification decision would be better taken by verifying the occurrence of possible *Moritz 226* specimens in Leiden (L). In addition to *B. moritziana*, it was found in the L herbarium, a *nomem nudum Bredemeyera floribunda* var. *moritziana.* No specimens of *Bredemeyera floribunda* var. *acutifolia* was lectotyped*,* because it was not possible to verify if there are specimens of the type collection in the G.

Comesperma floribunda species has been eventually treated as a combination based on *B. floribunda* (Pastore 2014), because the same epithet, "floribunda" is used for the same species in different genera, *Bredemeyera* and later in *Comesperma*. However, Saint-Hilaire & Moquin (1828b), in *Comesperma floribunda* [as Comespermum floribundum] protologue does not associate with *Bredemeyera*, who is mentioned in this same article: *"Nous ne parlerons pas davantage du genre Bredemeyera Wild.*[sic]*, qui n'est probablement qu'un Monnina ou un Mundia"* [We will not talk more about the *Bredemeyera* Wild., which is probably only a *Monnina* or a *Mundia*].

Bredemeyera floribunda is easily recognized by the long tomentose pedicel and large flowers (the largest of the *Bredemeyera* species); in addition, the capsule is densely pubescent, with a truncated apex.

The flowers of *B. brevifolia* and *B. floribunda* are morphologically close, especially by the wings, gynoecium and elongated carenas without differentiation of the claw. They can be easily distinguishable by inflorescence, fruits and leaves (inflorescences lax, fruits with truncated apex and leaves 6-12,2 × 2,2-5,8 cm in B. *floribunda* vs. congest inflorescences, fruits with rounded apex and leaves 2, 5-5.4 × 1.4-2.8 cm in *B. brevifolia*).

***Specimens Examined*— Bolivia.—**BENI: Vaca Diez, Secondary growth in old fields at the S edge of TG Estación Experimental, E edge of Riberalta, 11º00”S, 66º05”W, 20 May 1982, *J.C. Solomon* (MO, MBM).—LA PAZ: Franz Tamayo, Parque Nacional y Area Natural de Manejo integrado Madidi, 19 Mar 2005, *D. Choque et al. 215* (CTES, LPB, MO).—SANTA CRUZ: Andres Ibanez, Jardín Botanico de Santa Cruz, 12 km E of center of Santa Cruz, on road to Cotoca, 17º46'S, 63º04’W, 19 jul 1987, *M. Nee 35267* (CORD, NY); Chiquitos, 2 km E de Roboré, caerca del río Urasibique, 18º20'S, 59º46’W, 21 Apr 1980, *A. Krapovickas & A. Schinini 36358* (CTES); Cordillera, along highway from Santa Cruz to Abapó, 8 km S of Basilio, -18.194°, -63.183°, 21 May 2005, *M. Nee 53098* (MEXU). **Brazil.—**ACRE: Acrelândia, basin of Rio Madeira, Rio Abuña, Porto Dias, km 130 of BR-364, then 30 km on Ramal do pelé, 9º59’18.2”S, 66º46’40.5”W, 17 May 2009, *D.C. Daly et al. 13735* (NY, RB, UFACPZ); Rio Branco, Vista Geral and Caraparu, rio Cotinga, 11 Dec 1954, *B. Maguire & C.K. Maguire s.n.* (NY); Sena Madureira, Riozinho do Andirá, colocaçao Curitiba, 15 Jun 1995, *A.R.S. de Oliveira 626* (NY).—AMAZONAS: Manaus, Cachoeira Grande, 25 Aug 1923, *J.G. Khulmann 153* (RB, U).—BAHIA: Barreiras, Cachoeira Acaba Vidas (Rio de Janeiro), 12º6’0”S, 47º18’34”W, 6 Apr 2005, *R.M. Castro et al 1106* (HUEFS); Carinhanha, rodovia para Serra do Ramalho, 10,5 km da sede municipal, 14º12’29”S, 43º45’4”W, 15 Apr 2001, *J.G. et al. 3531* (CEPEC, RB); Cocos, estrada para itaquari, Riacho do Melo, 14º17’27”S, 44º43’46”W, 9 Apr 2005, *E.B. Miranda 746* (HUEFS, RB); Coribe, estrada de São Félix do Coribe para Coribe, região da microbacia do Rio Formoso, ca. 4km após distrito de Colônia, virar à direita e seguir mais 2 km, 13º37’33”S, 44º18’35”W, 8 Jun 2007, *M.M.M. Lopes et al. 1393* (CEPEC, HUEFS, NY); Correntina, Rio Correntina, 17 Mar 1995, *G. Hatschbach et al. 62008* (MBM); Formosa do Rio Preto, 11º3'S, 45º16’W, 2 Apr 2000, *T.R.S. Silva et al. 56* (HUEFS); Itapira, 17 May 1927, *F.C. Hoehne s/n* (HUEFS, SP).—CEARÁ: Cratéus, Caminho para Croatá, Serra das Almas, 06 Jun 2002, *F.S. Araújo 1584* (HUEFS); Crato, Floresta Nacional do Araripe, estrada do aeroporto, 22 May 1999, *A.M. Miranda 3320* (HUEFS);

Guaraciaba do Norte, Planalto de Ibiapaba, sítio tamboatazinho, Cachoeira do Urubu, 30 Apr 2010, *E.M. Marreira 92* (HUEFS); Jardim, estrada Porteira-Jardim, 7º24’70”S, 39º17’05”W, 20 Jul 2014, *E.C.L. Pinto et al. 56* (ALCB); Lavras da Mangabeira, Sítio Garra, 6º51'10,7"S, 38º52'14, 30”W, 9 jul 2014, *A.P. Fontana et al. 8248* (RB); Missão Velha, 7º20’6”S, 39º22’10”W.—DISTRITO FEDERAL: Catetinho, 25 Aug 1978, *E.P. Heringer 16149* (IBGE, MBM).—ESPÍRITO SANTO: Águia Branca, Córrego do Trinta, prop. Domingos Breda, 19º1'23"S, 40º38'52”W, 19 Oct 2006, *V. Demuner et al. 3000* (CTBS, MBML); Nova Venécia. Área de Proteção Ambiental da Pedra do Elefante. Serra de Baixo, 9 May 1998, *A.P. Fontana 5233* (UPCB); Santa Teresa, São João de Petrópolis, (Barra de Santo Hilário). Paulo Zanette, 10 May 2000, *V. Demuner 990* (HUEFS).—GOIÁS: Alexania, Br 060 entre Brasília e Goiânia, 16.11007º, 48.57509º, 1 Mar 2017, *M. Mota & J.F.B. Pastore 126* (CTBS, UPCB); Caldas Novas. Alternativa 15, ponto de hidrometria, no date, *S.P.C. da Silva 270* (CEN); Cavalcante, Chapada dos Veadeiros, RPPN Vale das Araras, 13º48’59”S, 47º27’2”W, 13 Apr 2008, *G. Martinelli et al. 16396* (RB, SPF); Colinas do Sul, Balsa do Rubão (rio Tocantins), km 4,5, 13º45’30”S, 48º07’05”W, 16 Mar 2001, *G. Pereira-Silva & J.B. Pereira 4891* (CEN, RB); Cristalina, 15 Aug 2002, *A.A. Santos 1422* (RB); Formosa, 09 Mar 1979, *E.P.Heringer 17226* (RB); Goiânia, parque estadual de Moura Pacheco, PEAMP (Parque dos Ipês), trilha do Zezinho, 30 Mar 2015, *R.C. Medonça et al. 5892* (IBGE, RB); Luziânia, Fazenda Juiz de Fora, 16º19’29”S, 48º17’43”W, 13 Apr 2005, *G. Pereira-Silva et al. 9959* (CEN); Montes Claros de Goiás, Margem da estrada de Ponte Alta para Registro do Araguaia, 15º46’51”S, 51º49’04”W, 29 Jul 2015, *J.E.Q. Faria et al. 4849* (UB); Morrinhos, 29 Mar 2008, *T.S. Assis 16* (CEN, UEG); Niquelândia, Estrada Niquelândia para a mina da Votorantim, GO 535, 14º22'37"S, 48º25'44”W, 21 Aug 2007, *M.M. Saavedra 452* (RB, MBM); Nova Roma, 22 Apr 2009, *L.P. Queiroz et al. 14124* (CTES, HUEFS, MBM); Pirenópolis, estrada para a subida da serra desde Pirenópolis, primeira estrada em direção da Cachoeira da Andorinha, 15º50’23”S, 48º55’36”W, 19 Aug 2007, *P.G. Delprete et al. 10303* (RB, UFG); Planaltina, 28 Sep 1965, *H.S. Irwin et al. 8770* (NY, UB); Porteirinha, cerca de 15 km de Jataí em direção a Serranópolis; na beira da estrada lado esquerdo, no date, *R.F. Vieira 1924* (CEN); Posse, Fazenda Sabonete, 14º03’59”S, 46º29’12”W, 7 Oct 2000, *M.A. Aparecida et al. 4428* (IBGE); Santa Rita do Novo Destino, Br 080, sentido Barro Alto/Brasília, logo após o trevo para Goianésia, 15º05’30”S, 48º51’20”W, 16 Apr 2013, *J.E.Q. Faria 3422* (RB, UB); São João da Aliança, 3 km by the road S of São João da Aliança, 23 Mar 1973, *W.R. Anderson 7775* (NY, UB); Serranópolis, Santuário da Vida Silvestre Pousada das Araras-RPPN, Fazenda Pedraria, próximo a Pedra Guardião, 18º27’05”S, 52º00’24”W, 21 Aug 1998, *M.L. Fonseca et al. 2039* (IBGE, RB); Silvânia, Fazenda Engenho

Velho, 16º19’13”S, 48º27’23”W, 2 Jun 2003, *G. Pereira-Silva et al. 7674* (CEN); Teresina de Goiás, 4 km by road S of Terezina, 18 Mar 1973, *W.R. Andersen et al. 7415* (NY, UB).—MARANHÃO: Barra do Corda, loteamento Cidade universitária, 5º32’39”S, 45º15’59”W, 5 Oct 2015, *M.L. Guedes et al. 23980* (ALCB); Carolina, Serra Morro do Chapéu, 29 Mar 1967, *G.T. Prance 4804* (NY); Caxias, caminho para Buriti de Inácia Vaz, 4º43’42”S, 43º08’07”W, 7 Oct 2015, *M.L. Guedes et al. 24202* (ALCB); Cururupu, Rosário, Aug 1914, *A. Lisboa s.n.* (RB); Estreito, margem esquerda do rio Feio, próximo à foz, 06º44'24"S, 47º29'21”W, 28 Aug 2007, *G. Pereira-Silva et al. 12076* (CEN); Fortaleza dos Nogueiras, 03 Apr 1984, *R.P. Orlandi 635* (RB); Imperatriz, estrada que vai de Imperatriz para Fazenda Vitória, 6 Aug 1949, *J. Murça Pires & G.A. Black 1725* (IAN, NY); Mirador, Parque Estadual do Mirador, 05 May 1998, *G.M. Conceição 245* (RB); São Luís, Island of São Luiz, no date, *R.L. Fróes 11715* (NY).—MATO GROSSO: Alta Flores, cerca de 65 km S de Alta Floresta, arredores do Garimpo do Cabeça, 19 Apr 1997*, V.C. Souza et al. 15149* (RB); Barra do Garças, road Chavantina to Barra do Garças, 55 km north of Barra do Garças, 15 Oct 1964, *G.T. Prance & N.T. silva 59448* (NY, UB); Cuiabá, proximidade do SESI, bairro Morada do ouro, 17 Oct 2010, *L. Amorim Neto 5032* (UB, UFMT); Novo Mundo, Parque Estadual Cristalino, extremo oeste do Parque, fazenda ao Sul da Pousada, 9º40’04,9”S, 55º13’46,0”W, 26 Aug 2008, *D. Zappi 1450* (K, NX); São José do Rio Claro, estrada de terra em direção ao Rio Arinos, 13º18’43”S, 56º43’40”W, 26 Apr 1997, *N.M. Ivanauskas et al. 1946* (RB); Terrenos, Rod. BR-262, Cachoeirão, 11 May 1976, *G. Hatschbach 38605* (MBM); Vila Bela da Santíssima Trindade, estrada para Fazenda Formosa, km 12,8 May 1983, *L. Carreira et al. 969* (INPA, MG, NY); Vila Rica, estrada para Fazenda Ipê, 09º56’25”S, 51º08’43”W, 4 Jun 1997, *F.R. Dário et al. 1205* (RB).—MATO GROSSO DO SUL: Bataguaçu, Porto XV, beira campo de inundação do rio Paraná, 13 May 1970, *G. Hatschbach 24238* (MBM); Brasilândia, estrada Brasilândia-Porto João André, 21º15’33”S, 57º54’47”W, 28 Apr 2005, *M.N.S. Stapf et al. 435* (HUEFS, RB); Campo Grande, Fazenda Santa Inês, 5 Apr 1991, *Equipe Santa Inês 169* (COR, RB); Corumbá, Fazenda Nhumirim, 19º20'S, 54º48’W, 10 May 1994, *V.J. Pott & A. Pott 6894* (CTES, CPAP); Landário, Fazenda Uruba, orla dos lageados rochosos, 8 Jun 1994, *G. Hatschbach et al. 60788* (MBM); Miranda, São Simão, Guaicurus, 10 Jun 2006, *E. Barbosa & J.M. Silva 1589* (MBM, RJ); Três Lagoas, Bairro de Jupiá, margem direita do Rio Paraná, 21º01'21,9"S, 51º45'54, 4”W, 8 Apr 1999, *A. Amaral et al. 332* (ALCB, BOTU).—MINAS GERAIS: Baependi, Toca dos Urubus, 15 Jan 2005, *F.M. Ferreira 823* (CESJ, RB); Belo Horizonte, Estação Biológica UFMG, 23 May 1990, *E.M. Bacariça, 25* (BHCB, RB); Brumadinho, Cabeceira Grande, estrada para o túnel de fuga, cerca de 500 m a nordeste do portão secundário, 28 Mar 2002, *G.P. da Silva 6384* (RB); Carmópolis

de Minas, Estação Ecológica da Mata do Cedro, 4 Apr 2004, *L. Echternacht & T. Dornas 362* (BHCB, RB); Corinto, Fazenda Diamante, base of Serra do Angico, 15 Apr 1931, *Y. Mexia 5629* (US); Curvelo, 03 Jun 1999, *E. Tameirão Neto 3051* (SPF); Delfinópolis, 20º17'51,3"S, 46º54'11"W, *M.G. Caxambu et al. 6161* (HCF, UNOP); Grao Mogol, beira de estrada, baixada com lagoa intermitente, com cerrado adjacente, no date, *A.C. Sevilha 4490* (CEN); Itaobim, 5 km de Itaobim, rodovia BA-116, 19 Jan 1984, *G. Hatschbach 47346* (MBM, RB); Ituiutaba, 08 May 1945, *A. Macedo 678* (US); Lagoa Dourada, 14 Jun 1954, *E.P. Heringer 3628* (UB); Minas Novas, estrada Turmalina- Matozinhos, 30 Mar 2006, *G. Ceccantini 2725* (SPF); Minas Novas, 5 km antes de Minas Novas, 11 May 1979, *H.C. de Lima 1028* (RB); Sabará, Rio das Velhas, no date, *E. Pereira 7302* (NY); Salinas, Aeroporto de Salinas, 07 Apr 2002, *T. Jost 469* (HUEFS); Santana do Riacho, km 133 ao longo da rodovia Belo Horizonte-Conceição do mato Dentro, 2 Mar 1991, *M.C. Amaral et al. s.n.* (CFSC, SPF); São Thomé das Letras, no date, *G. Hatschbach 31267* (MBM, NY); Uberlândia, Chácara Tapuirama, distrito de Tapuirama, 13 Jun 2007, *T.G. Oliveira & L.E. Guido* (HUFU); Unaí, região da ponte sobre o rio Preto, a 29 km do entroncamento BsB/Unaí/Palmital, em direção a Palmital - Divisa DF/MG, no date, *A.C. Sevilha 2113* (CEN); Várzea da Palma, Faz. Mãe D´água, 27 Apr 1963, *A.P. Duarte 7839* (RB).—PARAÍBA: Bonito de Santa Fé, Serra Grande, 7º13'19"S, 38º24'22"W, 26 Nov 2014, *A.P. Fontana & F.M.S. Sena 8846* (RB).—PARÁ: Altamira, Serra do Cachimbo, Br 163, trecho entre Guarantã do Norte MT e Castelo dos sonhos PA, 4 Jun 2007, *J.B.A. Bringel 374* (CEN); Augusto Corrêa, Patal, capoeira ao longo do caminho entre São Jorge e Patal, 1º05'54, 9"S, 46º38'47, 8"W, 14 Jun 2009, *U. Mehlig 627* (HBRA, INPA); Conceição do Araguaia, parcela 13,7º59'56"S, 49º24'90"W, 4 May 2017, *A. Cardoso et al. 2334* (MFS); Margem direita da Rodovia Tucuruí, repartimento, km 41-45, 7 Apr 1981, *N.A. Rosa 4067* (MBM, MG); Monte Alegre, São Tomé, estrada da Pariçó, ao lado do Igarapé São Tomé, 1º59'23"S, 54º03'9"W, 27 Jul 2010, *C.N. Fraga 2982* (HUEFS, RB); Santarém, Alter do Chão, Ilha do matarí, 25 May 1987, *L.C.B. Lobato & J. Oliveira 423* (HUEFS, MG); São Félix do Xingu, ponto 23, folha SC 22 VC, 12 Jun 1978, *C.S. Rosário 47* (INPA, MG, NY); São Geraldo do Araguaia, Apr 2004, *G. Pereira-Silva et al. 8892* (CEN); Tucuruí, Breu Branco, 10 May 1975, *M.G. Silva & R. Bahia 3491* (MG, NY); Viseu, Vila de itamichira, Serra do Piriá, Platô Caverna da Serra, 4 Oct 1999, *L. Carreira et al. 1738* (HUEFS, MG).—PARANÁ: Guaíra, sete quedas, 23 May 1971, *G. Hatschbach & P. Pelanda 26697* (MBM); Sengés, 19 Jan 1965, *L.B. Smith et al. 14833* (NY).—PERNAMBUCO: Exu, Chapada do Araripe, 19 May 2013, *M.E. Saraiva* (HST, RB).—PIAUÍ: Ribeiro Gonçalves, entrada da cidade, *A.M. Miranda et al. 5928* (HST, SPF); Tamboril do Piauí, 20 jul 1979, *F. Chagas e Silva 20* (IBGE, RB); Teresina, 3 Oct 2001, *J.M. Costa & A.F.*

Silva 382 (HUEFS, TEPB).—RIO DE JANEIRO: environs de Rio de Janeiro, *A. Glaziou 12434* (K);—RONDÔNIA: Ariquemes, Mineração Mibrasa, Setor Alto Candeias, km 128, Sudoeste de Ariquemes, 18 May 1982, *L.O.A. Teixeira 594* (NY); Cabixi, Fazenda Félix de Lima, influência Rio Cabixi/Guaporé, próximo ao Porto Félix, 21 Jun 2014, *M.G. Caxambu 5434* (HCF); Cacoal, Br 364, rodovia Cuiabá-Porto Velho, km 234, ao norte da cidade, morro da torre da Embratel, 11º12'S, 61º62'W, 23 Jun 1984, *C.A. Cid Ferreira et al. 4717* (INPA, RB); Guajará-Mirim, Sub-base Proj. Radam, fronteira Brasil-Bolivia, 1 May 1976, *M.R. Cordeiro 952* (IPEAN, RB); Itapuã do Oeste, Santa Bárbara, rodovia Br 364, km 120, 11 km da sede da Mineração, 9º10'S, 63º07'W, 26 May 1982, *L.O.A. Teixeira et al. 757* (INPA, NY); Machadinho d'Oeste, distrito de Tabajara, estrada entre a Vila Tabajara e Cachoeira 2 de Novembro, 8º55'55"S, 62º06'00"W, 1 jun 2015, *H. Medeiros 1731* (RB, RON); Porto Velho, Br - 364, sentido Rio Branco - AC, 15 Mar 2010, *V.X Silveira 198* (CEN).—RORAIMA: Cantá, Serra Grande, 26 Nov 2003, *S.J.R. Silva 134* (INPA); Margem da estrada Boa Vista Caracaraí, 15 Fev 1977, *N.A. Rosa 1509* (NY).—SÃO PAULO: Altinópolis, Morro do Forno, cerradão em uma face do morro mais sombria, quase mata seca, 27 Jul 1994, *W. Marcondes-Ferreira et al. 929* (SPF); Andradina, Reserva Biológica da Estação Experimental de Zootécnica de Andradina, 20º47'S, 51º34'W, 11 Apr 1995, *M.R. Pereira et al. 1007* (SPF); Bauru, Reserva Estadual de Bauru, 26 May 1994, *J.Y. Tamashiro et al. 153* (SPF); Botucatu, 18 km North, 14 km east os São Manuel, along the São Manuel-Piracicaba highway, near ex railway station "Treze de Maio", 22º45'S, 48º25'W, 31 Jan 1974, *I. Gottsberger 19R-31174* (RB, U); Castilho, margem esquerda do Rio Paraná, margem direita do Rio Aguapepi, 21º3'49"S, 51º44'44"W, 9 Apr 1999, *A. Amaral Jr. 303* (VIES); Guaraçaí, reserva legal, assentamento do INCRA, próximo à Fazenda Aroeiral, 7 Aug 1995, *M.R. Pereira-Noronha et al. 1596* (RB); Ipeúna, 12 Sep 1985, *E.L.M. Catharina & Borges 398* (ESA, RB); José Bonifácio, Estrada de terra José Bonifácio-Nova Aliança, Faz. Jacaré, 11 Jun 1995, *M.R. Silva 1777* (CTES); Limeira, 13 Apr 1954, *W. Hoehne s.n.* (RB, SPF); Matão, 2 May 1955, *D.M. Dedecca & Swierez 575* (CTES, IAC); Mogi-Guaçu, Reserva Biológica e estação Experimental de Mogi-Guaçu, 5 May 1992, *C.E.O. Lohmann et al. 9* (RB, SP); Paraguaçu Paulista, 6 km north of city of Paraguaçu Paulista at forest station, 22º22'S, 40º34'W, 6 Fev 1965, *G. Eiten et al. 5837* (HUFU, RB, UB); Pindorama, Fazenda Rocha ao lado da Estação do IAC, 21º12'50"S, 48º53'33"W, 15 Apr 1994, *V.C. Souza et al. 5734* (SPF); Piracicaba, bairro Godinho, 27 Jun 1992, *N. Ivanauskas s.n.* (ESA, MBM); Porto Ferreira, Parque Estadual de Porto Ferreira, trilha da borda do parque paralela à estrada, 21º49', 47º25', 13 May 2010, *A.P.C. Oliveira & F.A.N. Campos 52* (SPF); Potirendaba, 21º02'34"S, 49º22'38"W, 24 Apr 1999, *LR. Gimenez & D. Almella 6* (SJRP);

Presidente Bernardes, 51º34’W, 22º01’S, região do pontal do Paranapanema, rodovia Sp-272, Pirapozinho-Mirante do Paranapanema, entre km 22-23, margem da rodovia, 10 Mar 1996, *M.R. Pietrobom da Silva 3177* (SJRP, SPF); Ribeirão Preto, Sítio Marli, 6 Jun 2001, *O. Kotchetkoff-Henriques 403* (SPF, SPFR); Suzanápolis, Fazenda do Elói Vinha, 4 Aug 1995, *M.R. Pereira-Noronha et al. 1281* (RB); Votuporanga, Fazenda vizinha da Estação Experimental do IAC, 16 May 1995, *Brenacci 1644* (IAC, SPF).—TOCANTINS: Almas, região da Fazenda jaó, 11º38’01”S, 47º15’50”W, 5 Jul 2009, *F.C.A. Oliveira et al. 1535* (IBGE, RB); Ananás, Acampamento de Engevix, próximo ao porto Antonina, 06º07’52”S, 48º19’02”W, 14 Apr 2004, *G. Pereira-Silva et al. 8518* (CEN); Cristalândia, no local das minas de cristal, 21 May 1984, *M. Faulkner Bean 75* (HEPH); Darcinópolis, Fazenda Nova Veneza, 6º45'49"S, 47º45'10”W, 18 May 2010, *F.C.A. Oliveira et al. 2200* (IBGE, RB); Guaraí, 19 Mar 1968, *H.S. Irwin et al. 21496* (NY); Natividade, 32 km from Natividade on the road to Almas, 8 Nov 1997, *J.A. Ratter et al. s/n* (R, UB); Palmas, Serra do Lajeado, próximo ao córrego, Mata ciliar da Fazenda Roncadeira, 10º17’45”S, 48º7’40”W, 19 Mar 1994, *F. Bucci 238* (HEPH, UB); Palmeirópolis, Fazenda do Sr. Samuel, margem esquerda do rio Tocantins, 13º02'57”S, 48º10'16”W, 9 May 2007, *G. Pereira-Silva et al. 11705* (CEN); Paranã, estrada de acesso à fazenda do Sr. Raimundo, 13º02’12”S, 48º08’11”W, 8 May 2007, *G. Pereira-Silva et al. 11664* (CEN); Porto Nacional, 27 Jul 1955, *A. Macêdo 3941* (K). **Colombia.—**ANTIOQUIA: Antioquia, Km 34 of road Cañasgordas-Santa Fé de Antioquia, disturbed roadside vegetation, 20 Sep 1987, *J.L. Zarucchi 5502* (INPA).—LA GUAJIRA: Magdalena, on road to south from Riohacha, 10 Jan 1944, *O Haught 3920* (COL, US, USM).—SANTANDER: Los Santos, sector Norte de la Mesa de Los Santos, Vereda El Pozo, 6°44'37"N, 73°6'34”W, 18 Sep 2004, *J.L. Fernández-Alonzo et al. 21972* (COL). **Paraguay.—**ALTO PARAGUAY: Parque National defensores del Chaco, transition zone between forest and bald zone, 20º21'S, 60º20’W, 8 Aug 1983, *W. Hanh 1566* (MO, MBM).—CONCEPCIÓN: Bella vista, 15 Apr 1980, *C.C. Marmori* (CTES). **Peru.—**CUZCO: Convención, Rosario mayo, 1 Aug 1968, *R. Cháves 163* (CUZ). **Venezuela.—**ARAGUA: Parque National de Henry Pittier: paraiso trail to pico perquito, 8 Fev 1973, *T.B. Croat 21352* (MO, MBM); Bolivar Frontier between território do Rio Branco, Brasil and estado Bolivar, Venezuela, In quebrada woodland between Vista Geral and Carapuru, rio Coatinga.

BREDEMEYERA HEBECLADA (DC.) J.F.B.Pastore, Novon 20(3): 314. 2010. *Securidaca hebeclada* DC.(1824:341). “In brasilia”. TYPE: BRAZIL. No locality, no date, no colector (holotype: G-DC[00201579], isotype: FI[016685] [*Ex* Herb. Phil. Mercier.]). Fig. 13

Bredemeyera velutina A. W. Benn., Fl. Bras. 13(3): 53. 1874. "Habitat loco non indicate brasiliae: Pohl; in prov. Minas Gérais: Gardner 4418". TYPE: BRAZIL. Minas Gerais: Montes Claros, Jul 1840, *G.Gardner 4418* (lectotype, second step, here designated: K[000012834]!, isolectotype: B†[Foto F neg. 13086], CGE!, CGE[bis]!, K[000555747]!, MO[1784772], P[00733629]!, other specimens cited in the protologue: BRAZIL, Minas Gerais: 4–13 Aug 1820, [Munícipio de Turmalina?], Ad Columbis [Sítio Columbi], *J.B.E.Pohl 3049,* NY[00399993], US[00109071], W[0068500]!).

Comesperma kunthiana A.St.-Hil & Moq., Ann. Soc. Sci. Orleans sér. 2: 56. 1828 ou Mém. Mus. Hist. Nat. sér. 17: 338. 1828. *Catocoma kunthiana* (A.St.-Hil & Moq.) Benth., J. Bot. (Hooker) 4: 103. 1842. *Bredemeyera kunthiana* (A.St.-Hil & Moq.) Klotzsch *ex* A.W.Benn., Fl. Bras. 13(3): 53. 1874. "Nascitur in campis provincie Minas Gérais prope Iraja et praedium Mantiqueira". TYPE: BRAZIL. Minas Gerais: Passa quatro, 14 Mar 1822, A.*Saint-Hilaire, Catal-D n° 572* (lectotype designated in Pastore 2014: P[00733619!], isolectotype: P[00733620]!).

Bredemeyera confusa Chodat, Bull. Herb. Boissier 2: 173. 1894. “Habitat in sepibus ad Sebastianopolin, prov. Rio de Janeiro, Mart. It Brasil., 140 (v.s. in Hb. Monac.)”. TYPE: BRAZIL. Rio de Janeiro: no date, *C.F.P.Martius 140* (lectotype, perhaps the holotype: M[0152873]. Isolectoype: M[0152874]).

Bredemeyera autranii Chodat f. *obovata* Marques, Rodriguésia 32 (54): 286. 1980. TYPE: BRAZIL. Bahia: 1 Apr 1974, *R.M.Harley 17596* (holotype: RB[197964]!, isotypes: CEPEC[10266]!, P[2547155]!, U[0155273], US[2740491]).

Bredemeyera laurifolia var. *parvifolia* A.W.Benn., Fl. Bras. 13(3): 53. 1874. “Ad Rio de Janeiro: Widgren, Burchell 4921”. TYPE: BRAZIL. *J.F.Widgren 736* (lectotype, here designated: BR[0000008574565]; other specimens cited in the protologue: BRAZIL, May 1865, *W.J. Burchell 4921* (BR[0000008574558], K[000012893]); BRAZIL, 1844, Rio de Janeiro: *J.F.Widgren 1031* (C[10017320], K[000012892], S[08-19508], S[08-19510]).

Scandent shrub, branches velutine. **Leaves** chartaceous; petiole 5–6 mm long., tomentose to velutine; blade 1.6–5.7 × 1.3–4 cm, obovate to elliptic, apex obtuse to rounded, not mucronate, base acute to acute, margin not revolute, puberulous in both surfaces to velutine in both surfaces. **Panicles** lax, main axis straight, pubescent to velutine; racemes triangular. **Flowers** 3–4 mm long., bracts 1.5 × 0.9 mm, ovate, apex rounded, pubescent in dorsal surface, glabrous in ventral surface, bracteoles 1 × 0.7 mm, ovate, apex rounded, glabrous to puberulous in both surfaces. Sessile, external sepals 1.5–2 × 0.8–1 mm, ovate to oblong, apex rounded, not

mucronate, glabrous on both surfaces, ciliated, internal sepals 3–5 × 2.5–3.5 mm, obovate, apex truncate to rounded, not mucronate in dorsal surface, glabrous on both surfaces, ciliated in base; keel (excluding claw) 2.3–4.5 × 2–3.5 mm, glabrous on both surfaces; claw 0.7 mm long., glabrous; lateral petals 2.5–4 × 1–1.5 mm, slightly constricted in the median portion, assymmetrical, apex rounded to truncate, not wided, glabrous in dorsal surface, pubescents in median portion in ventral surface, ciliated in central margin; filament sheath 2.3–3 × 1–1.5 mm, externally puberulous in the apex, internally glabrous, free filaments 0.7 mm long., glabrous; style 3–4 mm long., arched, glabrous; ovary 1–2 × 0.8–1 mm, oblong, glabrous, with ring of trichomes in the base. **Capsule** 11–14 × 4–5, obovate, apex rounded, emarginate, glabrous.

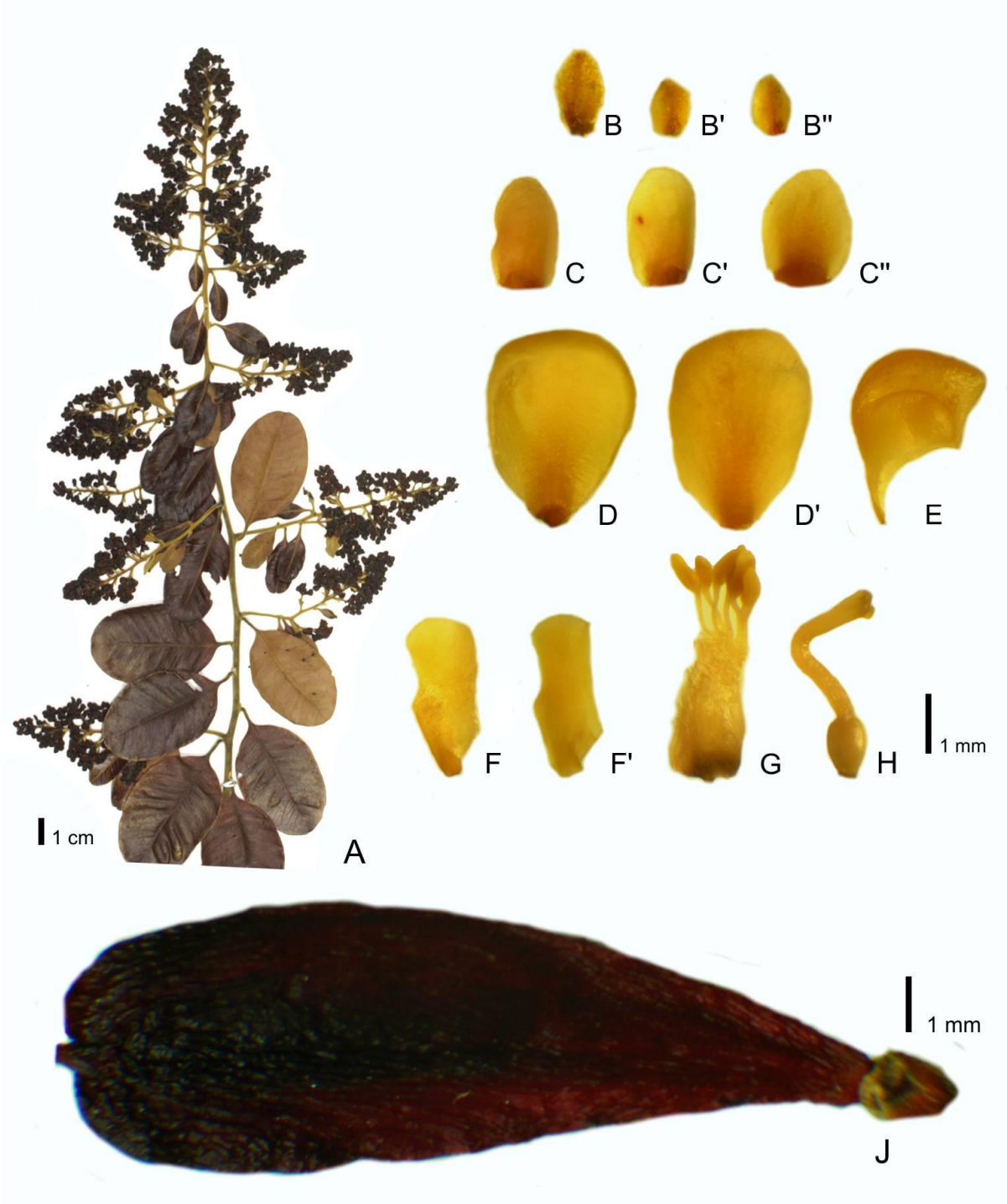


FIG. 13. *Bredemeyera hebeclada* (DC.) J.F.B.Pastore. Habit. B, B'e B". Bract and bracteoles. C, C' e C". External sepals. D e D'. Internal sepals. E. Keel. F e F'. Lateral petals. G. Androecium. H. Gynoecium. J. Capsule (A. *F.H.F. Nascimento 445*. B–H. *J.H.C Ribeiro 107* CTBS. J. *M.L.M. Azevedo e E.C. Lopes 318* HUEFS).

Distribuition—*Bredemeyera hebeclada* occurs in the Atlantic Forest and in cerrado regions, from Ceará to São Paulo, Pará, Goiás and Minas Gerais. Fig. 9

Conservation status—With occurrence extension (EOO) 2,572,187 km², the area occupancy (AOO) of 168 km^2, the species was evaluated as LC, and does not fit in any IUCN criteria (2017) and has a wide distribution in Brazil.

***Taxonomic notes*—**Pastore (2010) designated as lectotype of *Bredemeyera velutina* the *G.Gardner 4418* (K) specimen. However, two *Gardner 4418* specimens are keld in K herbarium, without a clear identification as which one is the lectotype. Thus, as a second step of the lectotipification, one of the two specimens cited as lectotype is here chosen, the one that presents original identification of Bennet, K [000012834].

The epithet "velutina" used by Bennett is probably due to an identification of Pohl present in one of the *B. hebeclada* syntypes, a name never published (Trigonia velutina) in W herbarium.

Bennet only identified, between the *Bredemeyera laurifolia* var. *parvifolia*, the specimen *J.F.Widgren 736* (BR [0000008574565]), which is here indicated as the lectotype. Chodat based the description of *Bredemeyera confusa* in two specimens *Martius 140,* thus the lectotype was chose considering the best material M [0152873]

The *Comesperma kunthiana* original description cites Saint Hilaire (1828a,1828b), according to Pastore (2014), both works were published almost simultaneously by Saint Hilaire, in the second half of 1828, with no correct date, and it is difficult to know which was the first to be published.

Bredemeyera hebeclada is related to *B. laurifolia*, both have pyramidal inflorescences and ring of hairs at the base of the ovary, sessile flowers, but they can be differentiated by the sizes of floral pieces (larger in B. laurifolia), leaf shape, and indumenta, but unlike *B. laurifolia*, *Bredemeyera hebeclada* presents great morphological variability with respect to vegetative characters.

***Specimens Examined*—Brazil.—**ALAGOAS: Coruripe, em área de canavial e regeneração, espécime coletado no conglomerado AL65, subunidade 1, subparcela 10, código 4RN, 10º04'49"S, 36º21'43”W, 4 May 2016, *A.A.S. Mascarenhas s/n* (MAC, RB).—BAHIA: Abaíra, 15 Aug 1998, *A.M. Giullietti et al. 1407* (HUEFS); Arataca, estrada a uma, 7 May 1971, *T.S. dos Santos 1606* (CEPEC, US); Canavieiras, rodovia Canavieiras/ Santa Luzia, km 17, ca. De 1,5 km após o entroncamento, 14 Jun 1988, *L.A. Mattos Silva et al. 2422* (CEPEC, HUEFS); Entre Rios, RPPN Fazenda lontra/Saudade, 31 Oct 1998, *J.B. Santos 0614* (HUEFS, HUNEBA); Jeremoato, Baixa dos Quetés, 9º58’59”S, 38º26’24”W, 17 Oct 2009, *E. Melo et al. 6676* (CTBS, HUEFS); Ilhéus, 2 km W of juction road to Vila Brasil and from Ilheus to Una (BA 001), the Junction ca 40 km S of Ilhéus just N of Rio Acuipe, 15º06’S, 39º 00’W, 10 May 1993, *W.W. Thomas et al. s.n.* (MBM, NY); Lençóis, estrada pra área do projeto plantas melíferas do IBF, 17 Mar 1988, *M.C. Ferreira et al. 86* (IBGE); Maraú, a 6 km de Maraú, na estrada para Ubaituba, 7 Aug 2001, *E.B. Santos et al. 315* (CEPEC, RB); Morro do Chapéu, ca.

5km L de Morro do Chapéu, na BA 05, 11º37'00"S, 41º01'21"W, 21 Apr 2001, *F. de Melo et al. 3436* (RB); Mucugê, estrada Mucugê-Cascavel km 18, 16 Sep 1992, *Lídio Coradin et al. 8647* (CEN); Nilo Peçanha, Itiuca, 19 Jun 1973, *T.S. Santos 2677* (CEPEC, US); Piatã, estrada Catolés-Inúbia, próximo a Ribeirão do meio perto a casa de Pedro de Dona, 13º13'S, 41º54'W, *W. Ganev 803* (HUEFS); Porto Seguro, Fazenda do Mamão, 24 Apr 1991, *G.L. Farias GLF-442* (CEN, CEPEC); Rio de Contas, 65km NE of Itabuna, at the mouth of the Rio de Contas on the N, bank opposite Itacaré, 39º01'W 14º15'S, *R.M. Harley et al. 17596* (CEPEC, NY, RB, P, US); Valença, Faz. Bela Vista (Sr. Ubiratã) 13º15'24"S, 39º1'19"W, 1 May 2012, *E. Matos 3483* (HUEFS); Vitória da Conquista, ramal a 15 km na estrada Vitória da Conquista à Ilhéus, 19 Fev 1992, *A.M. de Carvalho et al. 3804* (CEPEC, RB).—CEARÁ: Fortaleza, 17 Oct 1956, *A. Ducke 2552* (RB, US).—DISTRITO FEDERAL: Sobradinho, Reserva biológica de Contagem, 18 Aug 2011, *J.E.Q. Faria et al. 1594* (HUEFS, HUEG, UB).—ESPÍRITO SANTO: Linhares, Reserva Natural da Vale, trilha da Peroba-Osso, 15 Apr 2011, *J. Meirelles et al. 537* (ESA, RB).—GOIÁS: Abadiânia, ca. 6 km da Br 060, passando pelo povoado da Chapada, 16º07'19"S, 48º38'35"W, 17 Jan 2005, *J. Paula-Souza et al. 4015* (ESA, RB); Alto Paraíso de Goiás, Rio das Cobras, 12 Fev 1990, *G. Hatschbach et al. 53908 (*MBM, US). Caldas Novas, estrada que leva a alternativa 4; cerca de 5.7 km da estrada que liga a obra UHE, Corumbá a Caldas Novas, 9 Fev 1993, *T.A.B. Dias et al. 279* (CEN); Cavalcante, Fazenda Renascer, 6 May 2003, *J.F.B. Pastore 10* (CEN); Formosa, Fazenda Bambusal no km 35 da estrada para o Buraco das Araras, na estrada para o Hotel Pousada das Araras, 35 km de Formosa, 15º21'21,3"S, 47º08'28, 3"W, 19 Mar 2003, *R.C. Mendonça et al. 5437* (IBGE, SPF); Goiânia, a direita da GOM - 9 Nerópolis 15 km de Goiânia, 2 Mar 1969, *J.A. Rizzo 3832* (UFG, RB); Luziânia, Sítio do Dr. José Reis, 26 Fev 1975, *E.P. Heringer 14410* (RB, UB); Pirenópolis, Parque Estadual Serra dos Pirineus, 30 Jan 2004, *J.F.B. Pastore et al. 760* (CEN).—MINAS GERAIS: Barroso, Mata do Baú, 1 Mar 2001, *L.C.S. Assis 38* (CESJ, RB); Cabeceira Grande, margem esquerda do rio Preto, mata antes da guarita (saída para Palmital), à esquerda, 16º12'14"S, 47º20'03"W, 15 May 2002, *A.A. Santos et al. 1192* (CEN, RB); Carangola, APA Morro da Torre, 20º44'33"S, 42º3'18"W, 18 Apr 2009, *E. Melo et al. 8092* (HUEFS); Cristiano Ottoni, Br 3, km 334, 21 Mar 1963, *E. Pereira 7268* (BH, RB); Juiz de Fora, Morro do Imperador, 1 May 1970, Urbano 8465 (CESJ, RB); Lima Duarte, RPPN Pedra do Gavião, 26 Aug 2007, *R.M. Castro 1320* (CESJ, HUEFS); Nova Belém, Serra do Pitendo, 18º32'2"S, 41º07'29"W, 22 Apr 2013, *R.C. Forzza et al. 7588* (HUEFS, RB, VIES); São Gonçalo do Rio Preto, 27 Jun 2002, *F.N. Costa et al. 485* (CTBS, DIA); Uberlândia, Chácaras Eldorado, 13 jul 2007, *T.A.C. Lima s.n.* (CTBS, HUFU).—PARÁ: Marapanim: just east of the

fishing village of Camara which is ca. 11 km northwest of Marudá, 0º37'S, 47º41'W, 3 Apr 1980, *C. Davidse et al. 17844* (INPA, MG); PARÁ: Curuça, Ilha Ipomonga, porção sul da ilha, 0º38'42"S, 47º51'32”W, 24 May 2010, *U. Mehlig 832* (HBRA, INPA); Guarajá, 3 Aug 1964, *H.S. Irwin 5044* (NY, UB).—PERNAMBUCO: Tacaratu, Serra do Cruzeiro, 09º07'34,20"S, 38º09'80”W, 20 Oct 2016, *A.P. Fontana & J.R. Silva 9817* (PISF, RB).—RIO DE JANEIRO: Araruama, 9 Aug 1980, *D. Sucre 10234* (RB); Búzios, Estrada Cabo Frio-Búzios, próximo da entrada do Búzios bawen club, 12 Mar 1997, *P.R. Farág 376* (RB); Cambuci, Serra de São Caetano, à margem da estrada próximo à rampa de voo livre, 21º31'43"S, 41º53'25”W, 23 May 2015, *I.G. Costa 615* (RB).—RIO GRANDE DO NORTE: Parnamirim, Mata do jiqui, loteamento, 5º55’02”S, 35º12’02”W, 11 Apr 2013, *P.C. Gadelha et al. 3506* (HUEFS, JBP, MBM, NY, RB, SPF, VIES); São Gonçalo do Amarante, Fazenda Arvoredo, ca. 5 km a margem da área do Aeroporto de São Gonçalo do Amarante, em direção a comunidade Califórnia, 5º45'58"S, 35º23'27”W, 12 Sep 2011, *J.L. Costa-Lima et al. 585* (UFRN).—SÃO PAULO: São José dos Campos Jan 1909, *A. Löfgren 328* (RB).—SERGIPE: Lagarto, Colônia Treze, Mata do poção, 3 Nov 2010, *L.A.S. Santos 412* (ASE, HUEFS); Poço Redondo, Serra Guia, 9º48'19"S 37º41'03”W, 1 Apr 2013, *W.J. Machado et al. 71* (ASE, RB).

BREDEMEYERA LAURIFOLIA (A.St.-Hil. & Moq.) Klotzsch *ex* A.W.Benn., Fl. Bras. 13(3): 52. 1874. *Comesperma laurifolium* A.St.-Hil. & Moq., Ann. Soc. Sci. Orleans sér. 2: 56. 1828 ou Mém. Mus. Hist. Nat. sér. 17: 370. 1828. *Catocoma laurifolia* (A.St.-Hil. & Moq.) Benth., J. Bot. (Hooker) 4: 103. 1842. “Capueras prope vicum Itabira in provincia Minas Gerais/Boa vista da Barra do Caiao”. TYPE: BRAZIL. Minas Gerais: Itabira, 22 Fev–2 Mar 1817, *A.F.Saint-Hilaire Catal B1 787* (lectotype, designated in Pastore (2014): P[733624]!, isolectotype: P[733623]!). Fig. 14

Polygala disperma Vell., Fl. Flumin. 290. 1829. *Bredemeyera disperma* (Vell.) J.F.B.Pastore (2013:43). Iconografia: (1831:58). "Habitat fruticetis maritimis Regii Praedii S. Crucis". TYPE: BRAZIL. Rio de Janeiro: Silva Jardim, Reserva Biológica de Poço das Antas, 3 Feb 1993, *R.Guedes et al. 2288* (Epitype, designated in Pastore 2013): RB[00441813]!). *syn. nov.*

Securidaca flexuosa Turcz., Bull. Soc. Imp. Naturalistes Moscou XXXVI. I. 560. 1863. “In brasilia loco dicto Gongo Capo Lya colletore, cujus nomen, ni fallor, Hoher”. TYPE: BRAZIL. No date, *sem colector* (lectotype, here designated: KW[001000249], isolectotype: KW[001000250]). *syn. nov.*

Bredemeyera sellowii Hassk., Ann. Mus. Bot. Lugduno-Batavi i. 189. 1863. “Hab. brasilia: Sellow”. TYPE: BRAZIL. No date, *F.Sellow s.n.* (holotype: L[9754]). *syn. nov.*

Bredemeyera autranii Chodat, Bull. Herb. Boissier 2: 171. 1894. "Habitat in brasilia (Sello 134, 529, 474) Hb. Barbey-Boissier, in montibus dos Orgâos prov. Rio (Bunbury, on sandy soil yellow), Prov. St. Paul (Burch. 4297), Rio (Glaziou 853, 2493, 5738)". TYPE: BRAZIL. Rio de Janeiro: Serra do Mar, Jan 1865, *C.J.P.Bunbury s.n.* (sintype: G, isosintypes: BR[0000008574244], BR[000000857464], CGE; other specimens cited in the protologue: BRAZIL, Rio de janeiro: Mar 1872, *A.Glaziou 853* (BR[0000008574237], BR[0000008574718], BR[0000008574725], BR[0000008574732]), P[00733595]!, P[00733596]!; BRAZIL, Rio de janeiro: no date, *A.Glaziou 2493* (BR[0000008574220], P[00733598]!, P[02967584]!; BRAZIL, Rio de janeiro: Oct 1872, *A.Glaziou 5738* (K[000555746]!, P[00733599]!); BRAZIL, Rio de janeiro: Oct 1872, *A.Glaziou 5739* (K[000555745]); *W.J.Burchell 4297* (BR[0000008574695], BR[0000008574701], E[00631951], K[000555740]!, K[000555741]!, K[000555742]!, NY[399986], NY[399986], P[00733599], US[00109068]); BRAZIL, *F.Sellow s.n.* (CGE!, K[000555743]!, K[000555744]!); BRAZIL, *F.Sellow 474* (B†[foto F neg. 13081]); BRAZIL, *F.Sellow 529* (P[002547161].

Scandent shrub, branches glabrous to puberulous. **Leaves** chartaceous; petiole 5–7 mm long., puberulous to tomentose; blade (4)5–12 × 2.2–5.2 cm, elliptic, less often obovate, apex acute to acuminate, sometimes mucronate, base acute, margin not revolute, adaxial surface sparsely puberulous in the main vein, abaxial surface puberulous to glabrescent, to glabrous on both surfaces. **Panicles** lax, main axis straight to sinuose, pubescent to velutine; racemes triangular. **Flowers** 5–6 mm long., bracts e bracteoles subequal 1 × 1 mm, ovate, apex acute to rounded, puberulous to pubescent in dorsal surface, glabrous in ventral surface. Sessile, external sepals 2.5 × 1.5 mm, ovate to oblong, apex rounded, not mucronate, glabrous on both surfaces to glabrous in dorsal surface e pubescent in ventral surface, ciliated, internal sepals 5–6 × 3–3.5 mm, obovate, apex rounded, not mucronate in dorsal surface, glabrous in dorsal surface, puberulous to pubescents in ventral surface, ciliated; keel (excluding claw) 3 × 2.2–2.7 mm, glabrous on both surfaces, to ciliated in the base; claw 1.2–1.7 mm long., puberulous, pubescent, to glabrous e ciliated; lateral petals 4.5–5 × 1 mm, slightly constricted below the median portion, asymmetrical, apex rounded to truncate, not wided, glabrous in dorsal surface, pubescents in ventral surface, ciliated in basal portion; filament sheath 3.5 × 1.5–2.2 mm, externally puberulous in the apex, internally glabrous, free filaments ca. 1 mm long., glabrous; style 4–5 mm long., arched, glabrous; ovary 1.5 × 0.7–0.8 mm, oblong, glabrous, with ring of

trichomes in the base. **Capsule** 16–18 × 4.5–5 mm, obovate, apex rounded, emarginate, glabrous.

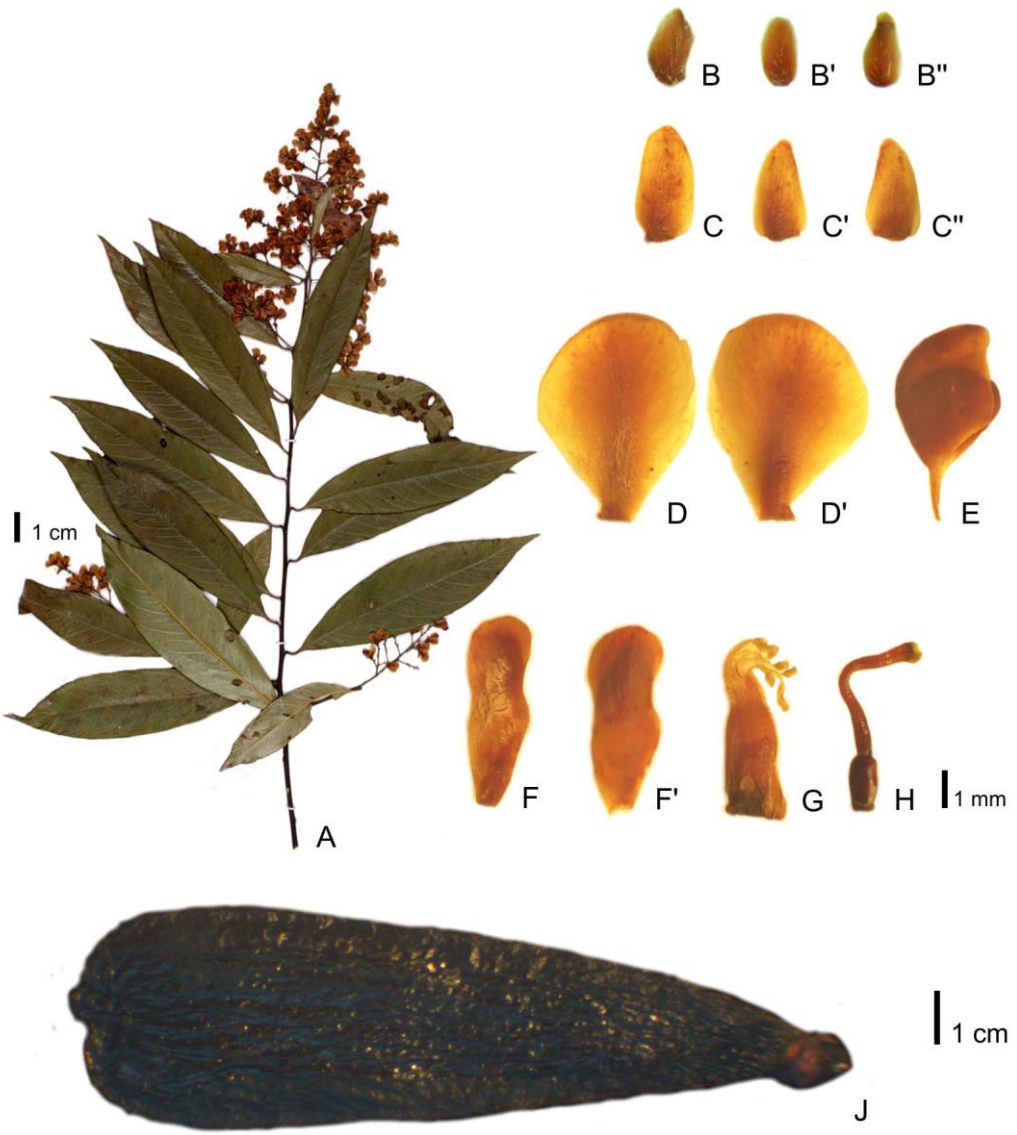


FIG. 14. *Bredemeyera laurifolia* (A.St.-Hil. & Moq.) Klotzsch *ex* A.W.Benn. A. Habit. B, B'e B". Bract and bracteoles. C, C' e C". External sepals. D e D'. Internal sepals. E. Keel. F e F'. Lateral petals. G. Androecium. H. Gynoecium. J. Capsule (A. *H.C. de Lima 4625* RB. B–H. *L. Kollman 10295* MBM. J. *R. Guedes et al. 2251* RB).

Distribuition—*Bredemeyera laurifolia* extends through the Atlantic Forest areas from Rio Grande do Norte to Paraná state. Fig. 15

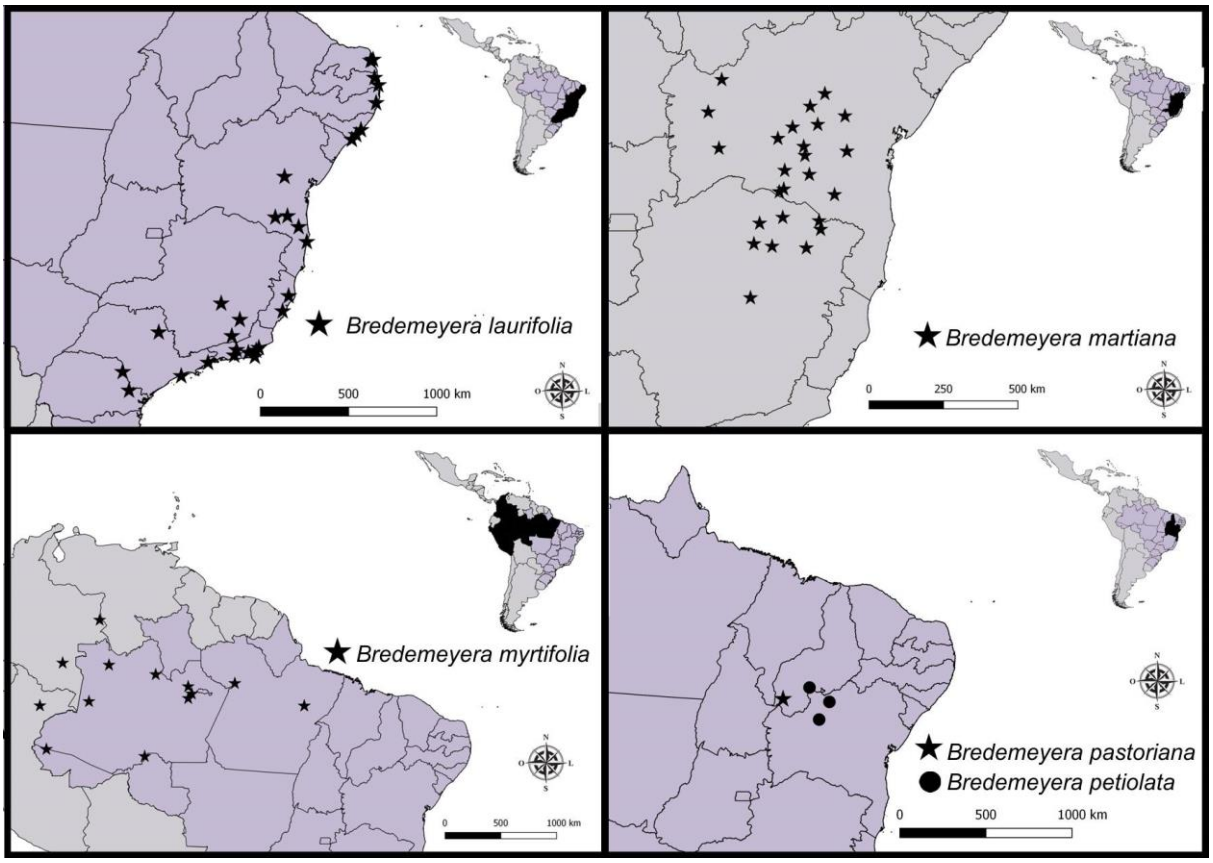


FIG. 15. Distribuition map of *Bredemeyera laurifolia* (A.St.-Hil. & Moq.) Klotzsch *ex* A.W.Benn., *Bredemeyera martiana* A.W.Benn., *Bredemeyera myrtifolia* A.W.Benn., *Bredemeyera pastoreana* and *Bredemeyera petiolata* M.Mota & J.F.B.Pastore.

Conservation status—*Bredemeyera laurifolia* presents an occurrence extension of (EOO) 873,746 km², the occurrence extension (AOO) of 88 km^2, the species was evaluated as LC, and does not fit any IUCN criteria (2017) and has a wide distribution in Brazil.

Taxonomic notes— The characters that differentiated *B. disperma* and *B. laurifolia* were never clear, with their specific delimitation guided by geographic distribution and hairiness.

Chodat (1894) cited, as a *B. autranii* sintype, a specimen cited by Bennett (1874) as *B. laurifolia* (Glaziou 853), admitting similarity between these two species. Marques et al. (1980), in your revision of the *Bredemeyera* for Brazil, shows difficulty in separating the two species, and later considered that the difference could just in hairiness (Marques & Gomes 2002).

After examining specimens from several localities, a gradient of hairiness, leaf size, as well the sinuosity intensity of the rachis was observed, without, however, having significant differences in flowers and fruits. In this way, these names are here treated as synonyms.

Pastore (2013), presented a typification of *B. sellowii*, where the material cited as holotype *F.Sellow s.n.* is L [601450]), but the correct number of this material is L [9754].

***Specimens Examined*—Brazil.—**ALAGOAS: Barra de São Miguel, 7km depois do entrancamento da Al 101/ Al 205, 25 Mar 1986, *R.P. Lyra-Lemos & G.L. Esteves 1189* (K,

MAC); Coruripe, Usina Coruripe, Mata do Capiata, 9º59'40,3"S, 10º0,95'O, 4 Nov 2002, *W.W. Thomas et al.* s.n. (NY, RB); Piaçabuçu, jenipapo, lado esquerdo da AI-212, no sentido Penedo-Piaçabuçu (5 km da ponte da Tapera), 21 Oct 1987, *I.S. Moreira et al. 22* (ALCB).—BAHIA: Camacã, Rodovia Camacã/Potiraguá, ca. 18, 5 km SW de Camacã, margens do rio Barras do Rio pardo, 15º33'390"S, 39º29'717"W, 9 Jan 2003, *J.G. Jardim et al. 4109* (CEPC, RB); Itaberaba, Fazenda Monte verde, Serra do Orobó, 13 Nov 1983, *J.C.A. Lima et al. 226* (IBGE, HRBN, RB); Santa Cruz Cabrália, área da Estação Escológica do Pau-Brasil (ESPAb), ca. De 16 km a W de Porto Seguro, rodovia 367 (Porto seguro/Eunápolis), 16º23'S, 39º8'W, 9 Fev 1984, *F.S. Santos 239* (CEPEC, RB); Vitória da Conquista, Serra da Conquista, 49º39'W, 14º53'S, 30 Mar 1977, *R.M. Harley et al. 20206* (K, RB).—ESPÍRITO SANTO: Cariacica, Reserva biológica Duas Bocas, 20º16'4"S, 40º31'31"W, 21 Jul 2008, *R.C. Forzza et al. 5270* (RB, MBM); Linhares, Reserva das Florestas Rio Doce, Apr 1986, *M. Sobral* (CESJ).—MINAS GERAIS: Belo Horizonte, 29 May 1988, *M. Barreto 6315* (BHCB, R); Juiz de Fora, Dias Tavares, 14 May 1971, *L. Krieger s/n* (CESJ 10520, NY); São Gonçalo do Rio Preto, Parque Estadual do Rio Preto, trilha Poço dos Veados, alojamento, 15 Jun 2002, *J.A. Lombardi et al. 4880* (BHCB, CESJ); Viçosa, Chacha valley, 22 May 1930,*Y. Mexia 4732* (NY).—PARAÍBA: Conde, Área de Preservação Permanente de Tambaba: Mata da Chica, 7º15'36"S 34º54'27'W, 31 May 2010, *A.A.M. Araújo et al. 271* (JPB, BR); Mamanguape, Reserva biológica Guaribas, área II, Palmeiral, Mata do Pau Brasil, 06º42'22"S 35º10'50"W, 18 Aug 2002, *A.C. Sevilha & G. Pereira-Silva 2180* (CEN).—PARANÁ: Cerro Azul, 25 Apr 1987, *G. Hatschbach et al. 51243* (MBM, UPCB); Santana do Itararé, 13 Fev 1915, *P.K.H. Dusén 16673* (NY).—PERNAMBUCO: Cabo de Santo Agostinho, Povoado Tiriri de Dentro, 29 jul 2011, *L.R.Silva 357* (HST, RB).—RIO DE JANEIRO: Cabo Frio, distrito de Barra de São João, Parque ecológico do mico Leão Dourado, fragmento próximo a ABANERJ, 22 May 2003, *A. Oliveira et al. 681* (RB); Ilha do governador, 8 Fev 1958, *G.F. Pabst 4395* (HB, NY); Macaé, distrito de Frade, caminho para o pico, 22º14,4'S, 42º05,9'W, 19 Fev 2000, *M.G. Bovini et al. 1931* (RB); Paraty, Praia Negra, picada p/ o Morro do Cambucá, 23 Mar 1992, *C. Farney 3104* (RB); Rio das Ostras, ARIE Itapebussus, jul 2004, *A. Oliveira & D. Oliveira 966* (RB); Serra dos Orgãos, 23 Mar 1892, *Glaziou 5737* (R); Silva Jardim, Lagoa de Juturnaíba, 2 Apr 1976, *D. Araújo et al. 1054* (RB).—RIO GRANDE DO NORTE: Macaíba, Escola Agrícola de Jundiaí, 5º53'15"S, 35º21'18"W, 31 Oct 2017, *M.B. Nascimento 76* (UFRN); Natal, Lagoa do Bonfim, 25 km south of Parnamirim Air Field, 17 May 1946, *J.J. Wurdack B-14* (US).—SÃO PAULO: Mogi-Mirim, Oct 1967, *H.M. de Souza s/n* (IAC, NY); São Simão, Bocaína, 8 Jul 1961, *Jacond 87* (RB).

BREDEMEYERA MARTIANA A.W. Benn, Fl. Bras. 13(3): 49. 1874. “Habitat in sepibus prov. Minas Gerais: Martius". TYPE: BRAZIL. Minas Gerais: *C.F.P.Martius 138* (lectotype designated in Marques (1980), perhaps the holotype: M[0153135]). Fig. 16

Scandent shrub, branches velutine. **Leaves** chartaceous; petiole 3–6 mm long., velutine; blade 3.5–6.5 × 1.5–3.3 cm, elliptic to oblong, apex rounded mucronate, sometimes emarginate, sometimes mucronate, base rounded to obtuse, margin not revolute, velutine in both surfaces. **Panicles** lax, main axis straight, densely velutine; racemes triangular. **Flowers** 4.5–5.5 mm long., bracts 1.2 × 0.6 mm, triangulares, apex acute, pubescent in dorsal surface, glabrous in ventral surface, bracteoles 0.7–0.8 × 0.5–0.6 mm, ovate, apex acute, pubescent in dorsal surface, glabrous in ventral surface. Pedicellate; pedicel 0.5–1 mm(2 mm in fruitification) mm, long., tomentose to velutine, external sepals 1.5–2 × 1.5 mm, ovate, apex acute to rounded, not mucronate, glabrous on both surfaces, ciliated, internal sepals 2.5–3.5 × 2.5 mm, orbiculares, apex obtuse, slightly mucronate in dorsal surface, glabrous in dorsal surface, puberulous in base da face ventral, ciliated; keel (excluding claw) 2–2.5 × 2 mm, glabrous on both surfaces; claw 0.5 mm long., ciliated; lateral petals 2.5 × 1.2–1.5 mm, constricted in the median portion, symmetrical, apex rounded, not wided, glabrous in dorsal surface, puberulous in median portion in ventral surface, ciliated in basal half; filament sheath 1.5 × 1.5 mm, externally puberulous in the apex, internally glabrous, free filaments 0.8–1 mm long., glabrous; style ca. 2 mm long., arched, densely pubescent in the basal portion; ovary 0.8–1 × 0.8–1 mm, orbicular, glabrous, without ring of trichomes in the base. **Capsule** 9–12 × 3–4 mm, obovate, apex rounded, emarginate, glabrous.

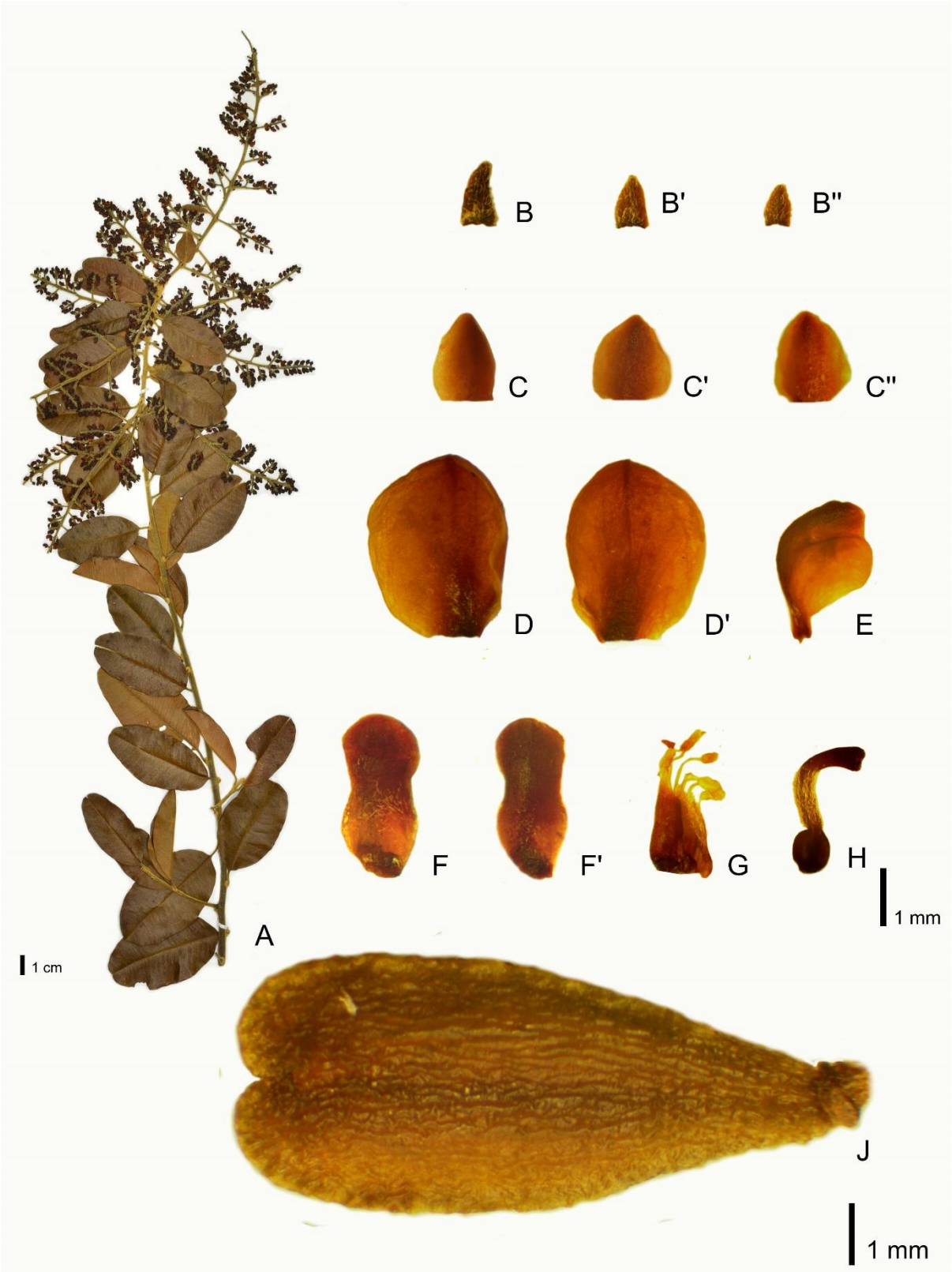


FIG. 16. *Bredemeyera martiana* A.W.Benn. A. Habit. B, B'e B". Bract and bracteoles. C, C' e C". External sepals. D e D'. Internal sepals. E. Keel. F e F'. Lateral petals. G. Androecium. H. Gynoecium. J. Capsule (A. *R.P. Oliveira et al. 404*. B–J. *G. Hatschbach et al. 77944* CTBS).

Distribuition— *Bredemeyera martiana* occurs in the cerrado and caatinga environments of the states of Bahia and Minas Gerais. Fig. 15

Conservation status— *Bredemeyera martiana* presents an occurrence of extension (EOO) of 256,151 km², the the area occupancy (AOO) of 96 km^2, the species was evaluated as "least concern" (LC), since it does not fit any IUCN criteria (2017).

Taxonomic notes—In the describing process of *B. martiana*, Bennet (1874) cited in the prototype the specimen 'Martius', from Minas Gerais, but without specifying a collection number. The only specimen of Martius found, which was identified as *'Bredemeyera martiana'* by Bennett, is deposited in the M herbarium under the number Martius 138 (M 0153135), which is cited as type by Marques (1980).

***Specimens Examined*—Brazil.—**BAHIA: Abaíra, Medonça de Daniel Abreu, 13º17'S, 41º51'W, 21 Fev 94, *W. Ganev 2980* (HUEFS, K); Barreiras, Roda Velha, 10 Mar 1979, *G. Hatschbach 42056* (MBM, US); Brumado, Serra das Éguas, próximo à torre da Embratel, 14º10'58"S, 41º43'28"W, 12 Mar 2002, *H.P. Bautista et al. 3208* (HRB, HUEFS); Caetité, Serra Geral, bloco IV, parcela 01,14º01'26"S, 42º31'05"W, 23 May 2008, *M.L. Guedes & F.S. Gomes 14506* (ALCB); Correntina, estrada Correntina-Santa Maria da Vitória, Br 135, ca. 8 km de Correntina, ao lado direito da estrada, 13º24º21"S, 44º30'56"W, 8 Apr 2005, *E.B. Miranda et al. 691* (HUEFS); Ibitiara, Morro da Torre, 12º40'11"S, 42º11'17"W, 2 jul 2001, *N. Roque et al. 548* (HUEFS); Lençois, 12º31'12S, 41º21'53"W, Jun 2002, *R.F.C.D. Funch 58* (HUEFS); Licínio de Almeida, Rod. BA-S/C Caculé, 14º38'29"S, 42º27'41"W, 30 Mar 2001, *J.G. Jardim et al. 3228* (CEPEC, HUEFS); Macaúbas, Passagem do meio, 16 Jun 2004, *G. Hatschbach et al. 77944* (MBM, CTBS); Maracás, Faz. Do Caboclo, lagoinha, 27 Fev 2000, *R.P. Oliveira et al. 404* (HUEFS, MBM); Morro do Chapéu, 17 May 1975, *A.L. Costa & G.M. Barroso s.n.* (ALCB); Mulungú do Morro, 11-15 km de Segredo na estrada para Bonito, 12º0123"S, 41º32'5"W, 30 Aug 1999, *D.S. Carneiro-Torres et al. 129* (HUEFS); Rio de Contas, Estrada Real, na picada à direita que vai para o Mirante da Cachoreira do Brumado, 13º36'39"S, 41º48'59"W, 15 Fev 2007, *R.M. Harley et al. 56677* (HUEFS); Ruy Barbosa: Serra do Orobó, 12º18'35"S, 40º29'3"W, 4 Sep 2004, *L.P. Queiroz et al. 9490* (HUEFS); Santa Rita de Cássia, Estrada Santa Rita, Br 135, 11º5'29"S, 44º32'39"W, 3 Jun 1999*, E. Melo et al. 2747* (HUEFS); Urandi, estrada Urandi/Licínio de Almeida, 15 km depois de Urandi, 19 km de Urandi, 14º44'35"S, 42º32'32"W, 10 Apr 2002, *T. Jost et al. 515* (HRB, HUEFS); Vitória da Conquista, arredores da cidade, 16 Apr 1995, *E. Melo 1216* (HUEFS, SPF).—MINAS GERAIS: Diamantina, Rodovia Br 367, 17º55'27,8"S, 43º23'11,8"W, 22 May 2013, *J. Cordeiro et al. 5084* (HUEFS, MBM); Divisa Alegre, próximo ao posto fiscal, 15º45'93"S, 41º20'3"W*, R.P. Oliveira et al. 1588* (HUEFS); Itinga, 2 jul 2003, *I.R. Andrade et al. s.n.* (BHZB, CTBS); Francisco Sá, cerca 10 km N, 18 May 1988, *G. Hatschbach 52163 & O.S.*

Ribas (MBM); Grão Mogol, Estrada Grão Mogol-Montes Claros, 16 Apr 1981, *L. Rossi et al. s.n.* (CESJ, CFCR); Nova Porteirinha, Toorre da CEMIG, 14 Apr 2007, *J.M. Silva & O.S. Ribas 5656* (HSF, MBM); Pedra Azul, estrada para a barragem do Soberbo, 6 km de Pedra Azul, 15º57'22"S, 41º17'20"W, 5 Apr 2002, *T. Ribeiro et al. 267* (HRB, HUEFS); Rio Pardo de Minas, 15º26'25"S, 42º29'30"W, 22 May 2005, *A.C. Sevilha et al. 4285* (CEN).

BREDEMEYERA MYRTIFOLIA Spruce *ex* A.W.Benn., Fl. Bras. 13(3): 50. 1874. "Habitat, rata ut videtur, in provinciis Para et do Alto Amazonas: Martius, Poeppig, Spruce 2288". TYPE: BRAZIL. Amazonas: Manaus, Jan - Aug 1852, *R.Spruce 2288* (lectotype, here designated: BM!, isolectotypes: BM!, C[100017321], C[100017322], CGE!, E[00327075] FI[1005819], GOET[009596], K[001133869]!, K[000263985], M[0153132], MO[245059], NY[399988], NY[399989], P[00733627]!, P[00733628]!, other specimens cited: BRAZIL. Pará: *C.F.P.Martius 126*, M[0153133], M[0153134]. BRAZIL. Amazonas, Manaus, 1831, *Poeppig 2624*, NY[399990], P[02547111]!). Fig. 17

Bredemeyera huberiana Chodat, Bull. Herb. Boiss. 2: 172. 1894. *Bredemeyera myrtifolia* A.W.Benn. *f. huberiana* (Chodat) Marques, Rodriguésia 32 (54): 284. 1980. "Habitat in Provincia Rio Negro in sylvis ad Villam Juriorum in ditione Japurensi Hb. Mart. 133, et in sylvis ad Barra do Rio Negro". TYPE: BRAZIL. Amazonas: Manaus: *C.F.P.Martius 133* (lectotype, here designated: M[0152893], isolectotypes: BR[8574848], M[0152894], M[0152895]). *syn. nov.*

Bredemeyera parviflora Spruce *ex* A.W.Benn., Fl. Bras. 13(3): 51. 1874. *Bredemeyera myrtifolia* A.W.Benn *f. parviflora* (Benn.) Marques, Rodriguésia 32 (54): 284. 1980. "Habitat ad Manáos, prov. Do Alto Amazonas (Spruce 1207, 1224). Etiam in Sylvis recentiobirus ad Lamas Peruviae: Matthews 1621". TYPE: BRAZIL. Amazonas: Manaus, Dec 1850-Mar 1851, *R.Spruce 1207* (lectotype, here designated: K[000263986]!, isolectotype: P[02547114]!, other specimens cited in the protologue: BRAZIL. *R.Spruce s.n.,* BM1, C[10017322], F[1005820], FI[005820], M[0153131], MG[019516], MPU[012045], NY[00399991], NY[00399992], W[1889-0108366]!. PERU. *Mathews 1621,* CGE!). *syn. nov.*

Scandent shrub, branches puberulous to pubescent. **Leaves** chartaceous; petiole 3–4 mm long., puberulous; blade 4–8 × 2–3.5 cm, ovate to oblong, apex acute to acuminate, not mucronate, base rounded, margin not revolute, glabrous to puberulous in the main vein in both surfaces. **Panicles** lax, main axis straight, pubescent to tomentose; racemes umbelliferous.

Flowers 3.5–4.5 mm long., bracts 0.8 × 0.6 mm, ovate, apex rounded, pubescent in dorsal surface, glabrous in ventral surface, bracteoles 0.7–0.8 × 0.4 mm, ovate to elliptic, apex rounded, pubescent in both surfaces. Pedicellate; pedicel 1.5–2.5 mm, long., glabrous to sparsely puberulous, external sepals 1–1.6 × 1–1.5 mm, ovate to oblong, apex rounded, not mucronate, glabrous on both surfaces, ciliated, internal sepals 2.5 × 1.7–1.8 mm, obovate, apex rounded, slightly mucronate in dorsal surface, glabrous on both surfaces, not ciliated; keel (excluding claw) 1.2–1.2–1.3 mm, glabrous on both surfaces; claw 0.7–0.8 mm long., glabrous; lateral petals 2–1.5 x 1–1.3 mm, constricted above the median portion, asymmetrical, apex rounded, not wided, glabrous on both surfaces, ciliated in the lateral margins; filament sheath 1.5–2 × 0.6–1 mm, externally puberulous in the apex, internally glabrous, free filaments 0.5–0.8 mm long., glabrous; style 1–1.2 mm long., arched, densely pubescent in the basal portion; ovary 0.6 × 0.5–0.6 mm, orbicular, glabrous, without ring of trichomes in the base. **Capsule** 10–13 × 3–4 mm, obovate, apex rounded, emarginate, glabrous.

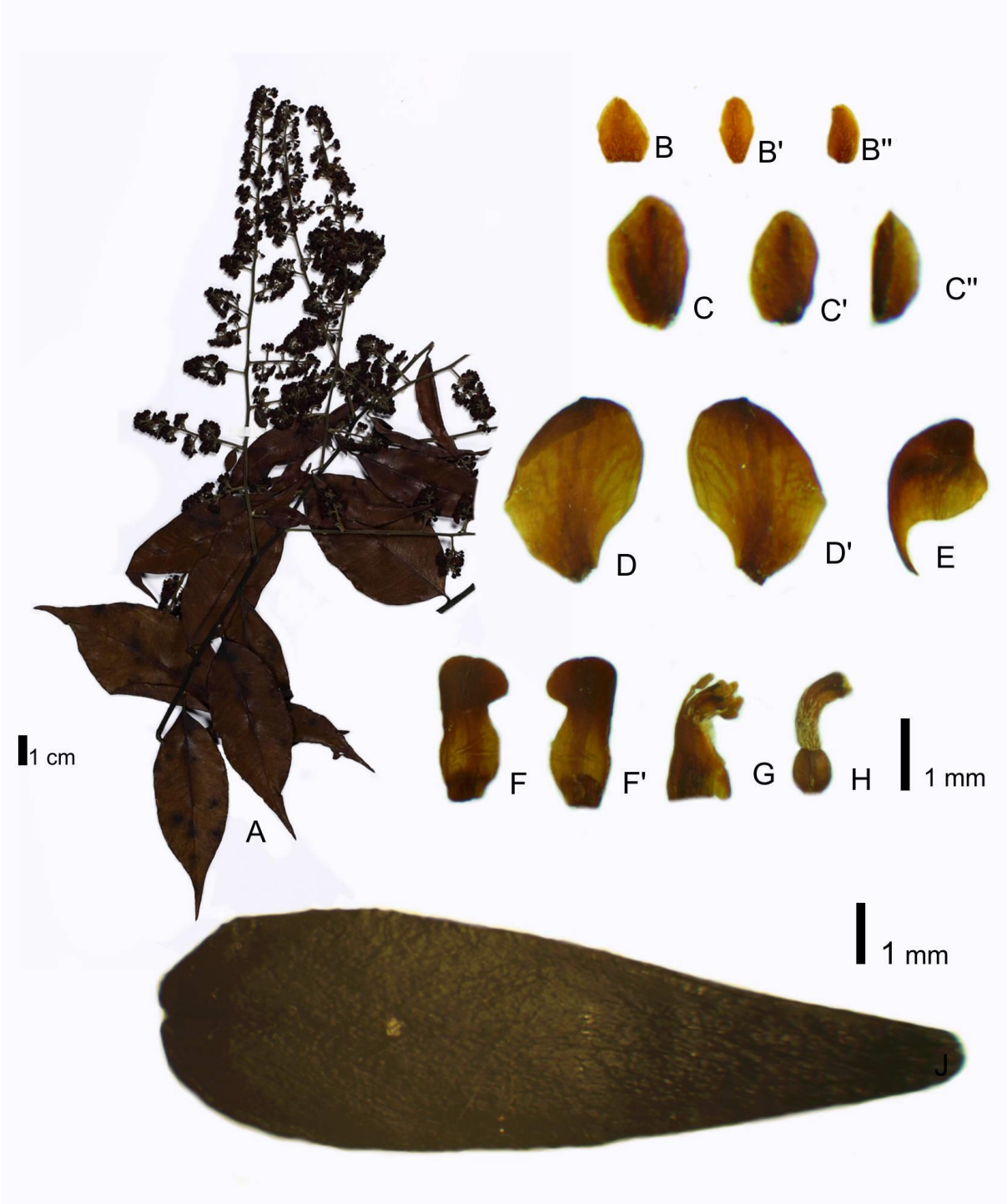


FIG. 17. *Bredemeyera myrtifolia* A.W.Benn. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule. A. *A.H. Medeiros 1482*; B–H. *C.A. Cid Ferreira et al. 243* (RB) e J. *C.A.A. Freitas et al. 02* (MBM).

Distribuition—Bredemeyera myrtifolia occurs in Amazonas and Venezuela (Marques 1980), besides Peru (Macbride 1950). Fig. 15 Conservation status—Bredemeyera myrtifolia presents an extension of occurrence of extension (EOO) 2,143,133 km², the area occupancy (AOO) of 56 km2, the species was evaluated as "least concern" (LC), since it does not fit any IUCN criterion (2017).

***Taxonomic notes*—**Among the original specimens of *B. myrtifolia*, the one chosen here as the lectotype is deposited in the BM herbarium. The lectotype present the signature of Bennet, suggesting that this was examined for description of the name *Bredemeyera myrtifolia*. The epithet, 'myrtifolia' (as nomem nudum), appears in a specimen collected by Spruce as 'Catocoma myrtifolia'.

Although Marques (1980) pointed out as syntypes of B. *myrtifolia* f. *parviflora Spruce 1207* (P) e *1224* (M e W), the next step would be to choose between these specimens, but Marques (1980) did not analyze the material of the K herbarium, Bennet analyzed and identified the specimen *Spruce 1207* (K[000263986]), suggesting that it was used in the description of the species in 1874. The epithet in *B. parviflora* came from a nudum nudum of the Spruce herbarium: Catocoma parviflora. In *Bredemeyera myrtifolia* f. *huberiana*, the material chosen as lectotype match the criteria of better conservation among the three specimens *Martius 133* of the herbarium M, since Chodat reviewed all these materials.

Curiously, in the duplicate deposited in the BR herbarium, Chodat identifies the specimen as *Bredemeyera laurifolia*, besides these two species being not related, that also created a nudum nudum of herbarium: *Bredemeyera huberiana* var. *laurifolia*. The locality "Barra do Rio Negro" or just "Rio Negro" refers to the present city of Manaus.

***Specimens Examined*—Brazil.—**ACRE: Cruzeiro do Sul, Br 307, Rod. Cruzeiro do Sul-Benjamin Constant, km 32, 23 Oct 1984, *C.A. Cid Ferreira et al. 5207* (INPA, MPEG, NY).—AMAZONAS: Barcelos, Serra do Aracá, 0º51'N, 63º22'W, 13 Fev 1984, *A.S. Tavares et al. 24* (INPA, UB); Borba, Anixim, basin of Rio Abacaxis, in campina (with abandoned Petrobras airstrip) just S of Igarapé Anixim, 4º17’S, 58º43’W, 7 Jul 1983, *J.L. Zarucchi* (NY, RB); Humaitá, Br 230, Rodovia Transamazonica a 94 km de Humaitá, reserva indígena dos Tenharim, 6º55’S, 62º15’W, 13 Apr 1985, *C.A. Cid Ferreira 5473* (RB, INPA, NY, US); Manaus, Manaus-Itacoatiara, Km 26, Reserva Florestal Ducke, 02º53’S, 59º58’W, 21 Sep 1994, *Vicentini et al. 705* (INPA, K, MBM, MG, MO, NY, RB, SP); Manaus, Reserva Florestal Ducke, Manaus-Itacoatiara, km 26 02º53'S, 59º58'W, 22 Jan 1997, *P.A.C.L. Assunção et al. 466* (RB, INPA, K, MG, NY, UB, C); Manicoré, Br 230, Reserva indígena dos Tenharim, 8º02’S, 62º00’W, 15 Apr 1985, *C.A. Cid Ferreira 5583* (INPA, NY, RB); Presidente Figueiredo, Rio Uatumã, margem direita a 300 m da cachoeira Morena, subindo o rio, 12 Aug 1979, *C.A. Cid Ferreira et al. 243* (NY, INPA, MO, RB, US); Rio Preto da Eva, Região do Rio Negro, 19 Apr 1959, *N.I. Froes s.n.* (IAN, UB); São Gabriel da Cachoeira, Alto Rio Negro, Itacoatiara-Mirim, entroncamento do aeroporto, na estrada para Camanaus, ramal à direita logo depois do Igarapé 0º9'56"S, 66º59'54”W, 29 Mar 2013, *D. Cardoso et al. 3328* (HUEFS); São

Gabriel da Cachoeira, Camanaus, road margin Camanaus-Uaupés, road near Camanaus, 1 Nov 1971, *G.T. Prance et al. 15971* (INPA, NY, U, US, K, S, MG, F, A, K, P, M, MICH, C, G, MO, COL, VEM); São Paulo de Olivença, platô sul da cidade, estrada para a localidade do Bom Fim, 25 Nov 1986, *C.A. Cid Ferreira et al. 8557* (INPA, NY).—PARÁ: Oriximiná, Rio Trombetas, Lago Maincoé, 8 km NE de mineração Santa Patrícia, 56º54'W, 1º23'S, 8 Jul 1980, *G. Martinelli 7322* (INPA, NY, RB); Oriximiná, Bacia do Rio Amazonas, Rio Trombetas, Floresta Nacional de Saracá-Taquera, área de concessão das empresas EBATA e GOLF, próximo a comunidade Lago do Acarí, 01º34'59,8"S, 56º11'28,4"W, 20 Mar 2014, *H. Medeiros 1482* (RB); Tucuruí, campinas de Santa Rosa, 4 Oct 1983, *J. Revilla et al. 8492* (INPA). RONDÔNIA: Madeira-Mamoré Railway, 14 Sep 1963, *B. Maguire et al. 56633* (NY, UB); Estrada Porto Velho-Cuiabá, Br 364, km 171, 6 Fev 1983, *C.A.A. Freitas et al. 02* (INPA). **Colombia**—AMAZONAS: La Victoria, comunidad Jirijrimo, cerca del raudal Jirijirimo, 0º02'53"S, 70º56'36"W, 21 Mar 2009, *J. Betancur et al. 13698* (COAH, COL).—GUAINÍA: Río Negro, El Castillo del Fuerte de San Felipe, cerca de la confluencia entre los ríos Guainía y Casiquiare, 1°36'20"N, 66°57'38"W, 12 Nov 1947, *R.E. Schultes 931* (COL); Inirida, 1-5 km desde la comunidad Zancudo al caño Veneno, camino através de conuco y bosque, 19 Aug 2008, *J. Betancur & J. Gonzáles 13477* (COL). **Peru**—LORETO: Maynas, Iquitos, quebrada de Shushuna near carretera de Zungaro Cocha, 7 Nov 1979, *S. McDaniel & M. Rimachi 23190* (F); SAN MARTIN: Lamas, 1851, *R. Spruce 1207* (K, P).

BREDEMEYERA PASTOREANA M.Mota *sp. nov.* TYPE:—BRAZIL. Piauí: Gilbués, Serra Guaribas, 20 May 1997, *L.P. Félix 7939* (holotype: RB[555956]!, isotype: HST[6594]). Fig. 18

Scandent shrub, branches pubescent. **Leaves** coriaceous; subsessile, petiole 1–2 mm long., pubescent; blade 8–10.3 × 3–4 mm, elliptic to obovate, apex rounded, mucronate, base acute, margin revolute, pubescent in both surfaces. **Panicles** congested, main axis straight, pubescent; racemes capitated. **Flowers** 6.9–7 mm long., bracts 0.7 × 0.5 mm, ovate, pubescent, densely ciliated, bracteoles 0.8–0.9 × 0.3 mm, elliptic, apex rounded to acute, puberulous in both surfaces. Pedicellate; pedicel ca. 2 mm, long., glabrous, external sepals 1.5–1.7 × 1.2 mm, ovate, apex acute, not mucronate, glabrous on both surfaces, ciliated, internal sepals 2–2.2 × 1.8 mm, oblong, assymetrical, apex rounded, slightly mucronate in dorsal surface, glabrous on both surfaces, not ciliated; keel (excluding claw) 1.7 × 1.3 mm, glabrous on both surfaces; claw ca. 0.5 mm long., glabrous; lateral petals 1.8–2 x 1.8 mm, slightly constricted above the median portion, asymmetrical, apex rounded, not wided, glabrous on both surfaces, ciliated in one of

the margins; filament sheath 1.8 × 1.2–1.5 mm, externally puberulous in the apex, internally glabrous, free filaments ca. 0.5 mm long., glabrous; style ca. 1.2 mm long., arched, pubescent in the basal portion; ovary 0.8 × 0.6 mm, oblong, glabrous, without ring of trichomes in the base. **Capsule** not observed.

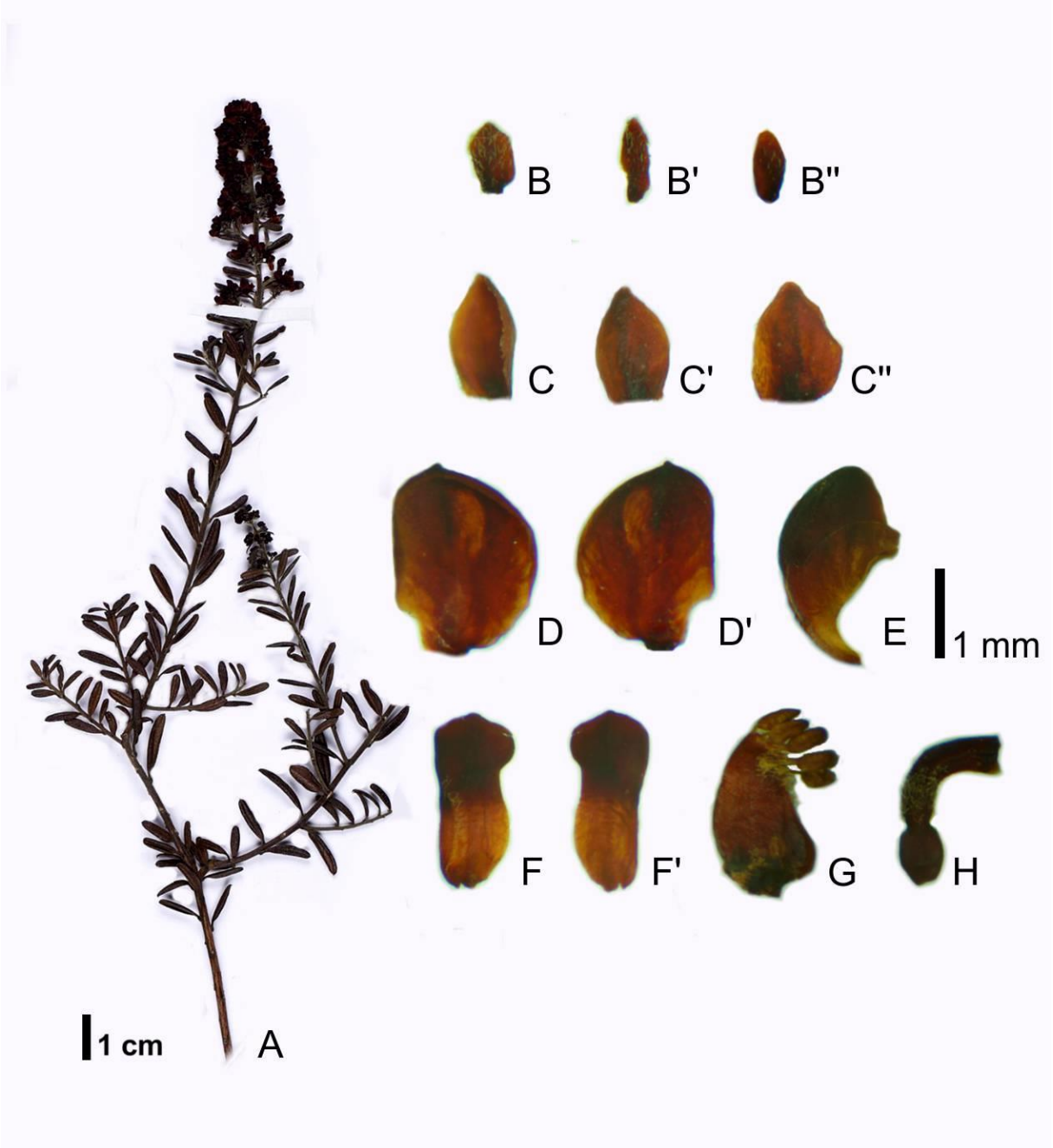


FIG. 18. *Bredemeyera pastoreana*. A. Habit. B, B'e B". Bract and bracteoles. C, C' e C". External sepals. D e D'. Internal sepals. E. Keel. F e F'. Lateral petals. G. Androecium. H. Gynoecium. J. Capsule (*L.P. Félix 7939* RB).

Distribuition— *Bredemeyera pastoreana* occurs in the south of Piauí, in a cerrado region. Fig 15

***Conservation status*—**Considering the occurrence extension (EOO) 0 km² and the area occupancy (AOO) 4 km^2 *B. pastoreana*, according to IUCN criteria this species is considered "Critically endangered" [CR B1 + 2a (2), b (iii)]. This criterion applies because the only specimen collected occurs outside the protected area and the vegetation of the municipality of Gilbués, where the species was collected, has been degraded by diamond mining in the region and loss of habitat is thus anticipated.

***Etimologia*—** The epithet is in honor to the botanist Dr. José Floriano B. Pastore, specialist in the family Polygalaceae.

Taxonomic notes*—Bredemeyera pastoreana* resembles *B. barbeyana* by subsessile leaves and short and capitated racemes, and can be easily distinguished by leaf blade, external sepals and carena and size of flowers, compared in table 1.

Table 1: Morphological comparative table of *Bredemeyera pastoreana* M.Mota e *B. barbeyana* Chodat.

Characters	*B. pastoreana* M.Mota	*B. barbeyana* Chodat
Leaf blade (size)	8–10.3 × 3–4 mm	1.3–3 × 1–2.3 cm
Leaf blade (shape)	Elliptical to obovate	Oblong to ovate
External sepals (size)	1.5–1.7 × 1.2	2.1–2.5 × 2
External sepals (shape)	Ovate, apex acute, not mucronate	Ovate, apex rounded, slightly mucronate
Flowers (size)	6.9–7 mm	5–5.5 mm
Keel (excluding claw) (size)	1.7 × 1.3 mm	2.5 × 1–1.2 mm
Keel claw (indumento)	Not ciliate	Ciliate
Lateral petals (size)	1.8–2 x 1.8 mm	2 × 1.5 mm

BREDEMEYERA PETIOLATA M.Mota & J.F.B.Pastore. Phytotaxa 351(2): 175. 2018. TYPE:—BRAZIL. Bahia: Barra. Vereda de Dois Riachos. 07 Nov 2009. *A.P.Prata et al. 1977* (holotype: CTBS[3535]!, isotype: ASE[18152]). Fig. 19

Scandent shrub, branches pubescent. **Leaves** coriaceous; petiole 2.8–3 mm long. pubescent; blade 2.3–2.8 × 1.3 1.7– cm. ovate to elliptic. apex acute. not mucronate. base rounded. margin not revolute. adaxial surface glabrous. abaxial surface pubescent. **Panicles** congested. main axis straight. pubescent; racemes capitated. **Flowers** 5–5.5 mm long. bracts 0.9 × 0.7 mm. ovate. apex rounded. pubescent in dorsal surface. glabrous in ventral surface. bracteoles 1 × 0.7 mm. ovate. apex acute. pubescent in dorsal surface. glabrous in ventral surface. Pedicellate; pedicel 1–1.5 mm mm. long. pubescent. external sepals 1.2–1.3 × 1.1–1.2 mm. ovate. apex rounded. not mucronate. glabrous in dorsal surface. pubescent in ventral surface. ciliated. internal sepals 2.8–3 × 2–2.2 mm. obovate. apex rounded. not mucronate in dorsal surface. glabrous on both surfaces. ciliated in base; keel (excluding claw) 2–2.2 × 1.3–

1.5 mm. glabrous on both surfaces; claw 0.5 mm long. ciliated; lateral petals 2–2.2 × 1.2–1.3 mm. constricted above the median portion. asymmetrical. apex rounded. not wided. glabrous on both surfaces. unilaterally ciliated; filament sheath 1.7–1.8 × 1.2–1.3 mm. externally puberulous in the apex. internally glabrous. free filaments ca. 0.5 mm long. glabrous; style ca. 1.4 mm long. arched. puberulous in the basal portion; ovary 0.8 × 0.7 mm. orbicular. glabrous. without ring of trichomes in the base. **Capsule** 7–9 × 2–3 mm. obovate. apex rounded. emarginate. glabrous.

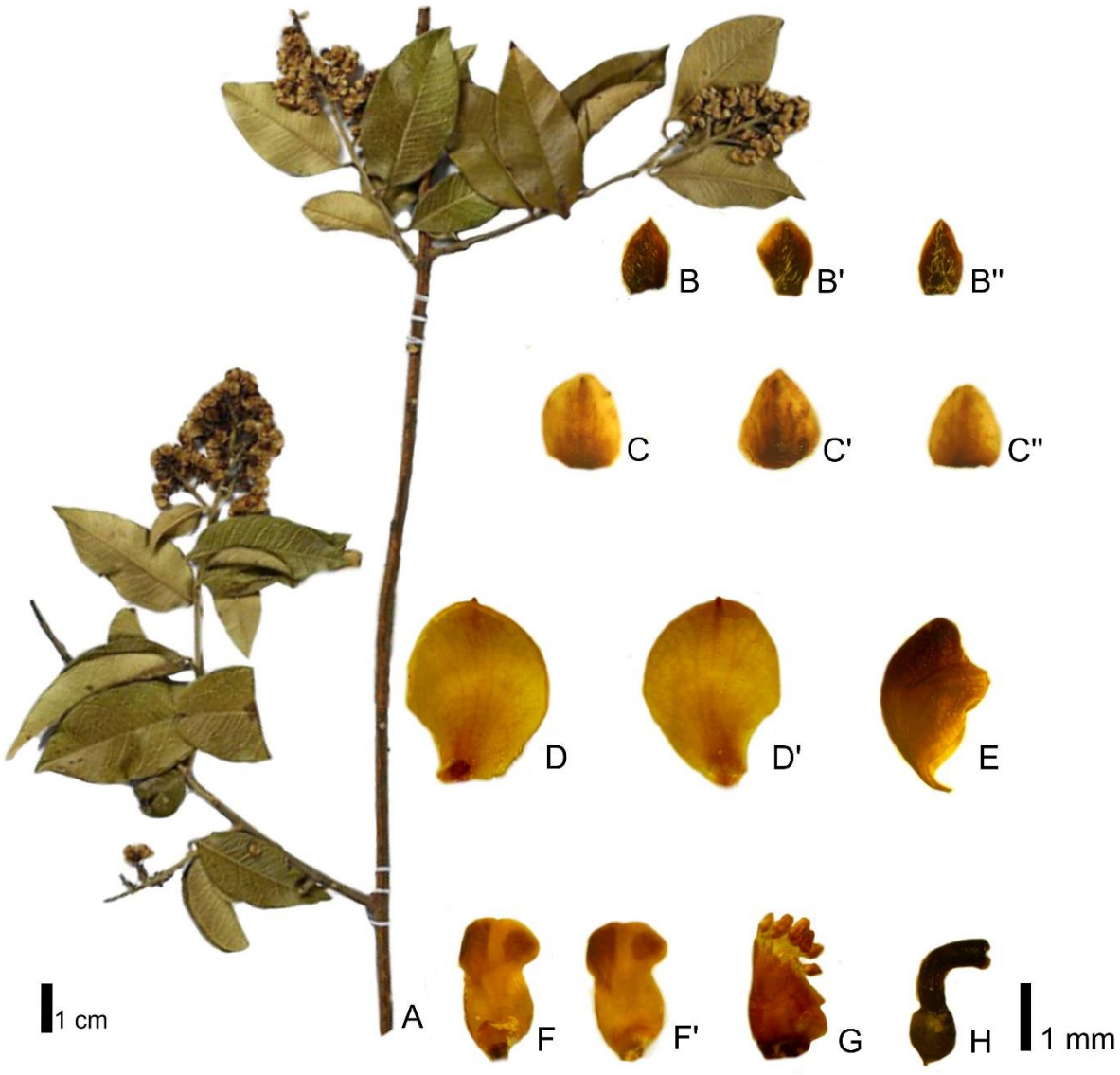


FIG. 19. *Bredemeyera petiolata* M.Mota & J.F.B.Pastore. A. Habit; B, B'e B". Bract and bracteoles; C, C' e C". External sepals; D e D'. Internal sepals; E. Keel; F e F'. Lateral petals; G. Androecium; H. Gynoecium e J. Capsule. A-J. *A.P. Prata et al. 1977* (CTBS).

Distribuition—*Bredemeyera petiolata* occurs in the states of Bahia on the banks of the São Francisco River and southeast of Piauí. Fig. 15

Conservation status—Considering the occurrence extension (EOO) 11.217 km². the area occupancy (AOO) 12 km^2. according to IUCN criteria *Bredemeyera petiolata* is considered "Endangered" [EN B2a (2). b (iii)]. This species is endemic to an area currently known as 'agricultural expansion' in the border of some states called 'Matopiba' - acronym based on the states of Maranhão. Tocantins. Piauí and Bahia. In this way, the decline of the habitat of this species is anticipated.

Taxonomic notes—*Bredemeyera petiolata*, recently described (Mota & Pastore 2018). is a rare species considering the frequency of specimens in the collections visited. Firstly. could be confused with *B. barbeyana.* which it can be readily recognized by the conspicuously petiolate leaves.

***Specimens Examined*—Brazil.—**BAHIA: Barra. Vereda de Dois Riachos. 7 Nov 2009. *A.P. Prata et al. 1977* (CTBS. ASE); Pilão Arcado. Brejo da Serra. Nov 2009. *A.P. Prata et al. 1971* (ASE. CTBS).—PIAUÍ: Guaribas. Parna Serra das Confusões–Barreiro. 23 L 0638460. 899742, 28 Mar 2007. *R. Barros et al. 2928* (HUEFS, TEPB).

EXCLUDED TAXA

Bredemeyera acerosa (Steetz) Steenis = *Comesperma acerosum* Steetz.
Bredemeyera aphylla (Benth.) Ewart & O.B.Davies = *Comesperma aphyllum* Benth.
Bredemeyera calymega (Labill.) Chodat = *Comesperma calymega* Labill.
Bredemeyera ciliata (Steetz) Steenis = *Comesperma ciliatum* Steetz.
Bredemeyera conferta (Labill.) Steenis = *Comesperma confertum* Labill.
Bredemeyera defoliata (F.Muell.) Chodat = *Comesperma defoliatum* F.Muell.
Bredemeyera drummondii (Steetz) Steenis = *Comesperma drummondii* Steetz.
Bredemeyera ericina (DC.) Chodat = *Comesperma ericinum* DC.
Bredemeyera flava (DC.) Steenis = *Comesperma flavum* DC.
Bredemeyera integerrima (Endl.) Steenis = *Comesperma integerrimum* Endl.
Bredemeyera lanceolata (R.Br. *ex* Benth.) Steenis = *Comesperma lanceolatum* (R.Br.) Benth.
Bredemeyera nudiuscula (DC.) Steenis = *Comesperma nudiusculum* DC.
Bredemeyera polygaloides (F.Muell.) Chodat = *Comesperma polygaloides* F.Muell.
Bredemeyera praecelsa (F.Muell.) Steenis = *Comesperma praecelsum* F.Muell.
Bredemeyera retusa (Labill.) Chodat = *Comesperma retusum* Labill.

Bredemeyera revoluta A.W.Benn. = *Securidaca revoluta* (A.W.Benn.) Marques

Bredemeyera rhadinocarpa (F.Muell.) Steenis = *Comesperma rhadinocarpum* F.Muell.

Bredemeyera scoparia (Drumm.) Chodat = *Comesperma scoparium* Drum.

Bredemeyera secunda (Banks *ex* DC.) Chodat *ex* Ewart & Davies = *Comesperma secundum* Banks *ex* DC.

Bredemeyera sphaerocarpa (Steetz) Steenis = *Comesperma sphaerocarpum* Steetz.

Bredemeyera spinosa (F.Muell.) Steenis = *Comesperma spinosum* F.Muell.

Bredemeyera sylvestris (Lindl.) Chodat *ex* Ewart & Davies = *Comesperma sylvestre* Lindl.

Bredemeyera virgata (Labill.) Steenis = *Comesperma virgatum* Labill.

Bredemeyera viscidula (F.Muell.) Steenis = *Comesperma viscidulum* F.Muell.

Bredemeyera volubilis (Labill.) Chodat = *Comesperma volubile* Labill.

ACKNOWLEDGMENTS

The authors wants to thanks to Dr. Marla Ibrahim curator of the ASE herbarium, who assisted sending materials, Ana Maria Giullietti-Harley and Raymond M. Harley for the great support for field expeditions in Bahia, CNPQ/ CAPES for the Master's fellowship, to the staff of the visited herbaria CEN, CTBS, CTES, HUEFS, MBM, MBML, R, RB, UB, UPCB, Lucas Marinho and Karina for help with materials.

LITERATURE CITED

APG IV. 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181: 1–20.

Aymard. G. A. P. E. Berry and B. Eriksen. 2004. Polygalaceae. Pp. 316–347 in *Flora of the Venezuelan Guayana. vol.* 8. eds. P. E. Berry. K. Yatskievych and B. K. Holst. St. Louis: Missouri Botanical Garden Press.

Bachman. S. J. Moat. A. Hill. J. de la Torre. and B. Scott. 2011. Supporting Red List threat assessments with GeoCAT: Geospatial Conservation Assessment Tool. *ZooKeys* 150: 117–126.

Bennett. A. W. 1874. Polygaleae. Pp. 1–82 in *Flora Brasiliensis*. vol. 13. part. 3. eds. C. F. P. Martius. A. W. Eichler and I. Urban. Leipzig: Friedrich Fleischer.

Bentham. G. 1842. Polygalaceae. Contributions towards a Flora of South America. Enumeration of plants collected by Mr. Schomburgk. in British Guiana. *Journal of Botany* 5: 99–133.

Bentham. G. 1851. Second report on Mr. Spruce's collections of dried plants from North Brazil. *Journal of Botany and Kew Garden Miscellany* 3: 161–166.

Chodat. R. H. 1893. Monographia Polygalacearum. *Memoires de la Société de Physique et d'Histoire Naturelle de Genève* 31: 1–500.

Chodat. R. H. 1894. Polygalaceæ novæ vel parum cognitæ. *Bulletin de l'Herbier Boissier* 2: 167–174.

Cribb. P.J. and A. L. V. Toscano de Brito. 1996. Introduction and History. Pp 23–46 in *João Barbosa Rodrigues: Iconographie des orchidées du Brésil.* Ed. 1. vol. 1. eds. S. Sprunger. P. J. Cribb and A. L. V. Toscano de Brito. Basiléia: Friedrich Reinhardt Verlag.

DRYFLOR 2016. Plant diversity patterns in neotropical dry forests and their conservation implications. *Science* 353: 1383–1387.

Eriksen. B. B. Stahl and C. Persson. 2000. Polygalaceae. Pp. 1–132 in *Flora of Ecuador*. vol. 65. eds. G. Harling and L. Andersson. Göteborg: University of Göteborg.

Eriksen. B. and C. Persson. 2007. Polygalaceae. Pp. 345–363 in *The families and genera of vascular plants*. vol. 9. ed. K. Kubitzki. Berlim: Springer-Verlag.

Hind. D. J. N. 2012. Catalogue of Brazilian Plants. A transcription of George Gardner's manuscript. Kew. Royal Botanic Gardens <http://www.kew.org/science/tropamerica/gardner/Catalogue.pdf>.

QGIS DEVELOPMENT TEAM 2016. QGIS Geographic Information System. Open Source Geospatial Foundation Project. Available from: http://qgis.osgeo.org.

Hasskarl. I. C. 1864. Polygalaceae. praesertim indicae. in: *Annales Musei botanici Lugduno-batavi* 1: 142–196.

IBGE 1960. *Enciclopédia dos Municípios* 6. Rio de Janeiro: Fundação Instituto Brasileiro de Geografia e Estatística.

INCT - Herbário Virtual da Flora e dos Fungos. 2019 [continuously updated]. Available from: http://inct.splink.org.br. (last accessed March 2019).

IUCN Standards and Petitions Subcommittee. 2017. Guidelines for using the IUCN Red List Categories and Criteria. Version 13. Switzerland and Cambridge. UK: IUCN.

Schomburgk. R. 1849. Poligalinae. Pp. 1181–1183 in *Reisen in Britisch-Guiana in den Jahren.* vol. 3. ed. *R. Schomburgk*. Leipzig: J. J. Weber.

Macbride J. F. 1950. Flora of Peru. *Publications of the Field Museum of Natural History. Botanical Series* 13: 781–999.

Marques. M. C. M. 1980. Revisão das espécies do gênero *Bredemeyera* Willd. (Polygalaceae) do Brasil. *Rodriguésia* 32: 269–321.

Marques. M. C. M. and K. Gomes. 2002. Polygalaceae in *Flora Fanerogâmica do Estado de São Paulo.* vol 2. eds M. G. L. Wanderley. G. J. Shepherd. A. M. Giulietti. T. S. Melhem. V. Bittrich and C. Kameyama. São Paulo: Instituto de Botânica.

Meijden. R. 1988. Polygalaceae. Pp. 455–539 in *Flora Malesiana.* vol. 10. eds. van C. G. G. J. Steenis & W.J.J.O. de Wilde. Dordrecht: Kluwer Academic Publishers.

Menck, J. T. M. 2009. A Questão do Rio Pirara - (1829 - 1904). Brasília: Fundação Alexandre de Gusmão.

Mota. M. & J. F. B. Pastore. 2018. Two new species of *Bredemeyera* (Polygalaceae) from Brazil. *Phytotaxa* 351: 171–175.

Oliveira. R. G. and M. D. G. D. Magalhães. 2012. Questão do Pirara: Roraima. *Textos e Debates* 1: 103–117.

Pastore. J. F. B. 2006. *Polygalaceae Hoffmannsegg & Link no Distrito Federal. Brasil*. Brasília: Universidade de Brasília.

Pastore. J. F. B. 2010. *Bredemeyera hebeclada* a new combination in Polygalaceae. *Novon* 20: 314–316.

Pastore. J. F. B. 2012. *Caamembeca:* Generic Status and New Name for *Polygala* subgenus *Ligustrina* (Polygalaceae). *Kew Bulletin* 67: 435–442.

Pastore. J. F. B. and J. R. Abbott. 2012. Taxonomic Notes and New Combinations for *Asemeia* (*Polygalaceae*). *Kew Bulletin* 67: 801–813.

Pastore. J. F. B. 2013. A Review of Vellozo's names for Polygalaceae in his Flora Fluminensis. *Phytotaxa* 108: 41–48.

Pastore. J. F. B. and P. L. R. Moraes 2013. Generic status and lectotypifications for *Gymnospora* (Polygalaceae). *Novon* 22: 304–306.

Pastore. J. F. B. 2014a. *Bredemeyera divaricata*. a new combination for the well-known Amazonian species of Polygalaceae. *Phytotaxa* 175: 59–60.

Pastore. J. F. B. 2014b. Saint-Hilaire's Polygalaceae. *Phytotaxa* 158: 201–223.

Pastore. J. F. B. J. R. Abbott. K. M. Neubig. M. W. Whitten. R. B. Mascarenhas. M. C. A. Mota and C. van den Berg. 2017. A Molecular phylogeny and taxonomic notes in *Caamembeca* (Polygalaceae). *Systematic Botany* 42: 54–62.

Pedley. L. 1984. A revision of *Comesperma* (Polygalaceae) in Queensland. *Austrobaileya* 2: 7–14.

Persson. C. 2001. Phylogenetic relationships in Polygalaceae based on plastidial DNA Sequences from *the trnL-F* region. *Taxon* 50: 763–779.

Reflora - Herbário Virtual. 2019 [continuously updated]. Available from: http://floradobrasil.jbrj.gov.br/reflora/herbarioVirtual/ (last accessed February 2019).

Reveal. J. L. 2012. Newly required infrafamilial names mandated by changes in the Code of Nomenclature for Algae. Fungi and Plants. *Phytoneuron* 33: 1–32.

Riviére. P. 2006. *The Guiana Travels of Robert Schomburgk: 1835–1844 : Explorations on Behalf of the Royal Geographical Society. 1835–1839* 1. London: Hakluyt Society.

Rodríguez. R. R. and W. Greuter. 2001. Humboldt. Willdenow. and *Polygala* (Polygalaceae). *Taxon* 50: 1231–1247.

Saint-Hilaire. A. F. C. P. and C. B. A. Moquin-Tandon. 1828a. *Conspectus Polygacearum Brasilie Meridionalis. Annales de la Société des Sciences. Belles-Lettres et Arts d'Orléans* 9: 44–59.

Saint-Hilaire. A. F. C. P. and C. B. A. Moquin-Tandon. 1828b. Premier Mémoire Sur La Famille Des Polygalées. *Mémoires du Museum d'Histoire Naturelle* 17: 313–375.

Silva. C. I. G. Araújo. and P. E. A. M. Oliveira. 2012. Distribuição vertical dos sistemas de polinização bióticos em áreas de Cerrado sentido restrito no Triângulo Mineiro. MG. Brasil. *Acta Botanica Brasilica.* 26: 748–760.

Thiers. B. 2019 [continuously updated]. *Index Herbariorum: A global directory of Public Herbaria and associated staff.* New York Botanical Garden's Virtual Herbarium. Available from: http://sweetgum.nybg.org/ih/(last accessed February 2019).

Turland, N.J., Wiersema, J.H., Barrie, F.R., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T.W., McNeill, J., Monro, A.M., Prado, J., Price, M.J. & G.F. Smith (Eds.) 2018: *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile* 159. Koeltz Botanical Books, Glashütten. DOI https://doi.org/10.12705/Code. 2018

van Dam. J. A. C. 2002. *The Guyanan Plant Collections of Robert and Richard Schomburgk.* in *Flora of The Guianas. Supplementary Series Fascicle.* vol. 3. ed. M. J. Jansen-Jacobs. Richmond: Royal Botanic Gardens.

van Steenis. C. G. G. J. 1968. Notes on *Bredemeyera* (*Comesperma*) with a new Papuan species and the Australian species listed (Polygalaceae). *Plant Biology* 17: 377–384.

Verkerke. W. 1985. Ovule and seed of Polygalaceae. *Journal of the Arnold Arboretum* 66: 353–394.

Weberling. F. 1989. *Morphology of flowers and inflorescences.* Cambridge: Cambridge University Press.

Willdenow. C. L. 1801. Drei Neue Pflanzen-Gattungen. *Der Gesellschaft Naturforschender Freunde zu Berlin* 3: 403–412.

CAPÍTULO 2. Two new species of *Bredemeyera* (Polygalaceae) from Brasil

Artigo **publicado** na revista ***Phytotaxa*** ISSN 1179-3163 (Qualis B2)
Doi: 10.11646/phytotaxa.351.2.5

Two new species of *Bredemeyera* (Polygalaceae) from Brasil

M. MOTA[1] & J.F.B. PASTORE[2]

[1]*Programa de Pós Graduação em Botânica, Universidade Federal do Paraná, Av. Francisco H. dos Santos s.n., Campus do Centro Politécnico, 81531-980, Curitiba, Paraná, Brasil. e-mail: mcamota@outlook.com.*

[2]*Universidade Federal de Santa Catarina, Campus Curitibanos, Rodovia Ulisses Gaboardi, km 3, Curitibanos, 89520-000, Santa Catarina, Brasil.*

Abstract. Two new species of *Bredemeyera* (Polygalaceae) for Brasil are described and illustrated. *Bredemeyera atlantica* occurs in Atlantic Forest in the Brasilian states of Espírito Santo and Rio de Janeiro, whereas *B. petiolata* occurs in *Cerrado* savanna vegetation along the São Francisco river in the Northeast, in the state of Bahia and Piauí. Photographic plates of the habit and comparative floral morphology with allied species, as well as a distribution map, are provided.

Resumo. Duas novas espécies de *Bredemeyera* (Polygalaceae) são descritas e ilustradas. *Bredemeyera atlantica* ocorre na Mata Atlântica do Brasil, nos estados do Espírito Santo e Rio de Janeiro, enquanto *B. petiolata* ocorre no Cerrado, ao longo do rio São Francisco no Nordeste, no estado da Bahia. São fornecidas uma prancha fotográfica do hábito e morfologia floral comparativa com espécies próximas, bem como um mapa de distribuição.

Keywords. *Bredemeyera atlantica, Bredemeyera petiolata*, Cerrado, Atlantic forest

Introduction

Bredemeyera Willdenow (1801: 412), a neotropical genus with 11 species (BFG 2015), occurs mostly in savannas from Mexico to Paraguai, but also in Amazonian and Atlantic forests. The genus is part of the tribe Polygaleae and can be characterized by papilionoid flowers with 2 internal petaloid sepals and 5 petals (two rudimentary petals (absent, in some species), two lateral petals, and the keel), paniculate inflorescences, loculicidal capsules, and arillate seeds with long trichomes exceeding the length of the seed. Here we present two new species of *Bredemeyera* for Brasil, one from Atlantic Forest in the states of Espírito Santo and Rio de

Janeiro, and the other from *Cerrado* savanna vegetation along the upper middle part of the São Francisco river in Bahia State and Piauí.

Material and Methods

The morphological studies were performed based in specimens kept in the following herbaria: ALCB, ASE, CRVD, CTBS, ESA, HUEFS, MBM, MBML, R, RB, TEPB and UEC. Dissected samples were imaged using stereomicroscope with digital capture software TopView™ and edited through the software Corel Photo-Paint x7. We used the discontinuing measurements, shape and indumenta of vegetative and floral pieces to delimited the new species (Fig. 2).

Bredemeyera atlantica M.Mota & J.F.B.Pastore *sp. nov*.

TIPO:—BRASIL, Espírito Santo: Presidente Kennedy, Praia das Neves, entre as rodovias ES 060 e 261,21º13'3"S, 40º57'39"O, 15 Jun 2004, *A.M. Assis & M.D.S. Demuner 1992* (holótipo: CTBS2257!; isótipo: MBML40970).

Scandent shrubs ca. 2 m tall, stem cylindrical, tomentose. Leaves alternate, petiole 5–6 mm, tomentose, lamina 2.5–5.5 × 1.8–2.5 mm, obovate to elliptic, apex obtuse to rounded, rarely cuneate, base cuneate, margin entire, chartaceous, upper surface pilose to puberulous, lower surface pilose. Inflorescences in panicles. Flowers 2.8–3 mm long., greenish white, sessile, subtended by one bract at base 0.8–1 × 0.7–0.8 mm, ovate, externally pubescent, internally glabrous, sessile, ciliate, apex rounded, and two narrow bractéolas ca. 1 × 0.6 mm, ovate, ciliate, with both surfaces glabrous; sepals glabrous on both surfaces, one lower external sepal 1.5–1.8 × 1–1.6 mm, ovate-oblong, two upper external sepals 1.3–1.7 × 1.2–1.6 mm, ovate, two internal sepals (wings) 1.5–2.5 × 1.7–2 mm, obovate; keel (excluding claw) 2.2–2.6 × 1.5–2.2 mm, glabrous on both surfaces; claw ca. 0.5 mm long, glabrous; lateral petals 1.8–2 × 1–1.3 mm, asymmetrical, apex rounded, externally glabrous, inner surface puberulous in mid-portion; filaments fused into a sheath 1.5–2 × 2–3 mm, internally glabrous, externally pubescent at apex, free portions 1.5 mm, glabrous; rudimentary petals ca. 0.2 × 0.2 mm, ovate, glabrous; style 2.2–2.5 mm long, arched, laterally compressed, glabrous; ovary 0.7–1 × 0.6–1 mm, oblong, glabrous (lacking a trichome ring at base). Capsules 9.5–10 × 3–5 mm, obovate, apex emarginate, glabrous. Seeds 5 mm long (with trichomes 8 mm long). (Fig. 1B).

Bredemeyera atlantica morphologically resembles *B. hebeclada* (DC.) J.F.B.Pastore (2010: 314) and *B. laurifolia* (A.St.-Hil. & Moq.) Klotzsch ex A.W.Bennett (1874: 52) by the sessile flowers and pyramidal inflorescences. However, the new species is readily distinguished by its smaller flowers (2.8–3 mm long. in *B. atlantica vs* 4 mm long. in *B. hebeclada* and 5.5 mm long. in *B. laurifolia*), and by the absence of a trichome ring at the ovary base, present in *B. hebeclada* and *B. laurifolia* (Fig. 2).

Distribution: —*Bredemeyera atlantica* occurs in Atlantic forest of the Brasilian states of Espírito Santo and Rio de Janeiro (Fig. 3).

Specimens Examined:— BRASIL. Espírito Santo: Guarapari, 16 Abr 1984, *L. Krieger s.n.* (CESJ, CTBS); Linhares, Reserva da Companhia Vale do Rio Doce, 8 Abr 2006, *J.G. Rando et al. 212* (CRVD, ESA, MBM, RB); Santa Teresa, Pedra Alegre, 13 Abr 1996, *H.Q. Boudet Fernandes et al. 3162* (CTBS, MBML); Pedra da Onça, 16 Abr 1986, *H.Q. Boudet Fernandes et al. 1930* (CTBS, MBML); Pedra da Onça, 26 Jun 2003, *A.M de Assis et al. 887* (CTBS, HUEFS, MBML); Presidente Kennedy, Praia das Neves, entre as rodovias ES 060 e 261,21º13'3.1"S, 40º57'39.5"O, 15 Jun 2004, *A.M. Assis & M.D.S. Demuner 1992* (CTBS, MBM). Rio de Janeiro: Carapebus, estrada de acesso à Fazenda São Lázaro a caminho da praia, 15 Ago 1996, *I.M. da Silva & J.G. Silva 351* (R); Iguaba Grande, área do NEIG/UFF, Ponta da Farinha, 22º50'53"S, 42º11'47"O, 19 Mai 2005, *H.C Lima et al. 6345* (RB, UEC); Rio das Ostras, restinga do Mar do Norte, vegetação arbustiva semi aberta de estrada secundaria, entre os Km 152 e 153 da rodovia RJ- 106, 13 Ago 2001, *L.C. Giordano et al. 2384* (RB); Rio das Ostras, Balneário das Garças, 14 Dez 1999, *R.N. Damasceno* (RB); Rio das Ostras, 5 Abr 1971, *L. Krieger s.n.* (CESJ, CTBS);

Etymology:—The specific epithet refers to the Atlantic Forest of Brasil, the ecoregion where it is found.

Phenology:— *Bredemeyera atlantica* has been found in flower from Abr to Jun.

Figure 1: Habit of *Bredemeyera atlantica* and B. petiolata. A. *Bredemeyera atlantica* (A.M. Assis & M.D.S. Demuner 1992); B. *Bredemeyera petiolata* (A.P. Prata et al. 1977).

Bredemeyera petiolata M.Mota & J.F.B.Pastore *sp. nov.*

TIPO:—BRASIL, Bahia: Barra, Vereda de Dois Riachos, 7 Nov 2009, *A.P. Prata et al. 1977* (holótipo: CTBS3535!; isótipo: ASE18152).

Scandent shrubs, stem cylindrical, glabrous, branches pubescent. Leaves alternate, petiole ca. 3 mm, pubescent, lamina 2.3–2.8 × 1.7–1.3 mm, ovate to elliptic, apex acute, base rounded,

margin entire, chartaceous, upper surface glabrous, lower surface pubescent. Inflorescences in panicles. Flowers 3–4 mm long., white, pedicel 1–1.5 mm, with one bract at base 1 × 0.5 mm, ovate-oblong, externally glabrous, internally pubescent, ciliate, apex rounded, sessile, and two narrow bractéolas ca. 1.2 × 1 mm, ovate, ciliate, externally pubescent, internally puberulous; external sepals ovate, sparsely ciliate, the lower one 1.4–1.5 × 1.2–1.3 mm, externally puberulous, internally glabrous, two upper ones 1.5–1.7 × 1.1–1.3, both surfaces glabrous, two internal sepals (wings) 2.8–3 × 1.8–2.2–2 mm, obovate, externally glabrous, internally sparsely puberulous, ciliate near the base; keel (excluding claw) 2.2–2.4 × 1.2–1.6 mm long, glabrous on both surfaces; claw ca. 0.5 mm long., glabrous, ciliate; lateral petals 2.2–2.5 × 1.2–1.3 mm, asymmetrical, apex rounded asymmetrically emarginate, externally glabrous, inner surface puberulous in midportion; filaments fused into a sheath 1.8 × 2.2–2.4 mm, internally glabrous, externally pubescent at apex, free portions 0.5 mm, glabrous; rudimentary petals absent style 1.5–2 mm long, arched, laterally compressed, puberulous; ovary 1–1.2 × 1 mm, glabrous, orbicular. Capsules 7–9 × 2–3 mm, obovate, glabrous, apex asymmetrically emarginate (Fig. 1A).

Bredemeyera petiolata resembles morphologically *B. barbeyana* Chodat (1894: 173) but is easily distinguished by the presence of petioles (*vs*. sessile leaves in *B. barbeyana*), the shape of the leaves (ovate to elliptic and apex acute in *B. petiolata vs.* oblong to ovate and apex rounded in *B. barbeyana*), and by the apex of the lateral petals (asymmetrically emarginate in *B. petiolata vs.* rounded in *B. barbeyana*) (Fig. 2).

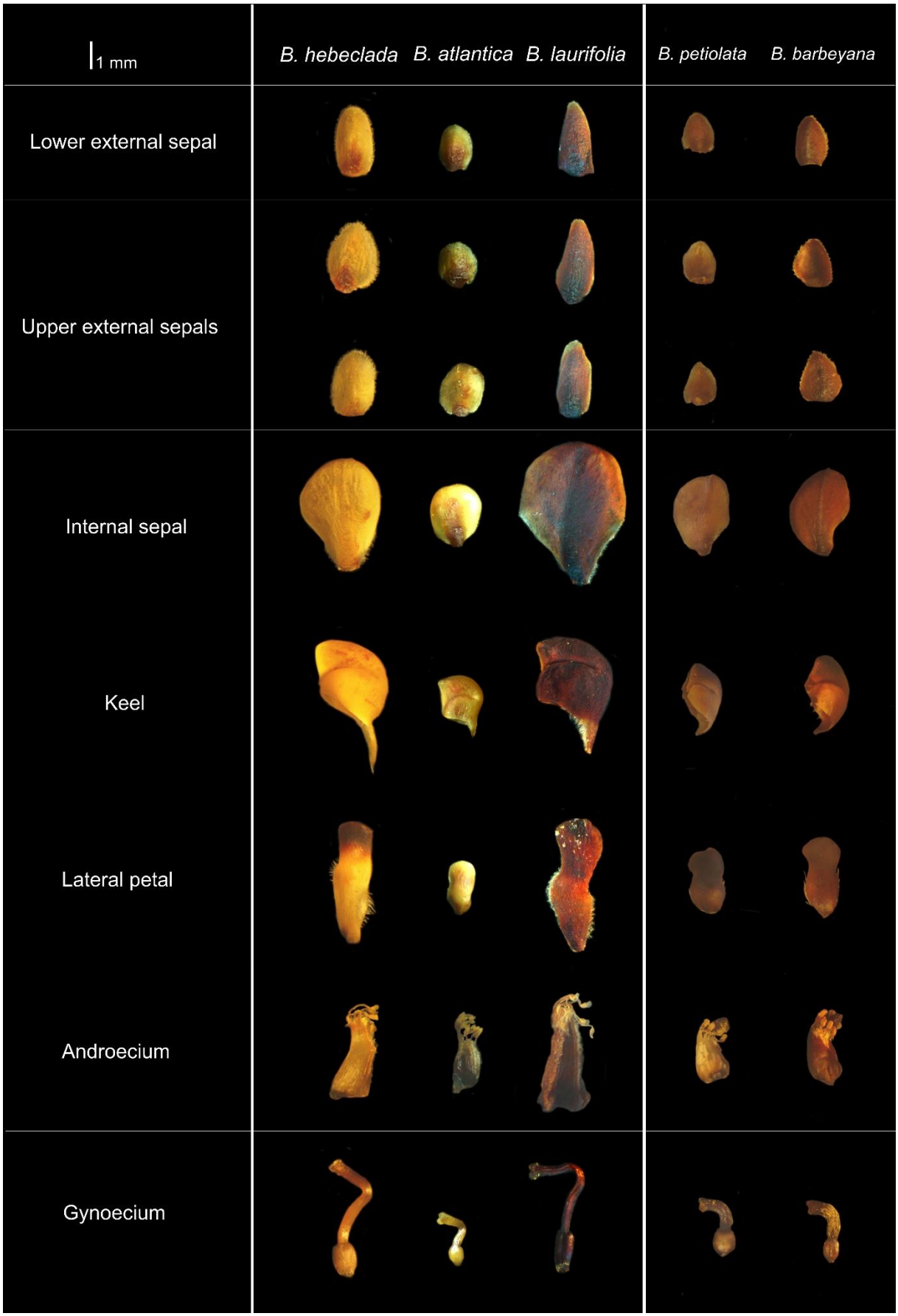


Figure 2: Comparison of floral details of *B. atlantica* M. Mota & J.F.B. Pastore, *B. laurifolia* (A. St.-Hil. & Moq.) Klotzsch ex A.W. Benn and *Bredemeyera hebeclada* (DC.) J.F.B.Pastore and *B. petiolata* M. Mota & J.F.B.

Pastore with *B. barbeyana* Chodat. *Bredemeyera hebeclada* (T.A.C. Lima s.n. CTBS); *B. atlantica* (A.M. Assis 1992); *B. laurifolia* (L. Kollman 10295); *B. petiolata* (A.P. Prata et al. 1977); *B. barbeyana* (Hatschbach et al. 77847). [Scale bar = 1mm]. Photos by Michelle Mota.

Distribution:—*Bredemeyera petiolata* occurs in the municipalities of Barra and Pilão Arcado of Bahia State, on the banks of the São Francisco river, Caracol and Guaribas of Piauí (Fig. 3).

Specimens Examined:—BRASIL. Bahia: Barra, Fazenda do Brejo, médio São Francisco, 11º05'S, 43º08'W, 16 Nov 2007, *M.L. Guedes et al. 13918* (ALCB); Barra, Vereda de Dois Riachos, 7 Nov 2009, *A.P. Prata et al. 1977* (CTBS, ASE); Pilão Arcado, Brejo da Serra, Nov 2009, *A.P. Prata et al. 1971* (ASE, CTBS). Piauí: Caracol, caverna depois da entrada do Parque, 9º13'13"S, 43º29'19"O, 17 jul 2011, *A.A. Conceição et al. 3394* (HUEFS); Guaribas, Parna Serra das Confusões–Barreiro, 23 L 0638460,899742,28 Mar 2007, *R. Barros et al. 2928* (HUEFS, TEPB).

Etymology:—The specific epithet refers to the petiolate leaves of the species.

Phenology:—*Bredemeyera petiolata* has been found in flower in Mar, jul and Nov and fruiting in Nov.

Figure 3: Distribution map of *B. atlantica* and *B. petiolata.*

Acknowledgments: The authors are grateful to Dr. Marla Ibrahim de Oliveira for providing material used for the description of *Bredemeyera petiolata* and to Alex Popovkin for the English review of this manuscript.

References

Bennett, A.W. (1874) Polygaleae. *In:* Eichler, A.W. & Urban I. (Eds.) *Flora brasiliensis*. 13 (3). F. Fleischer, Leipzig, pp. 52–74.

BFG (2015) Growing knowledge: an overview of seed plant diversity in Brasil. *Rodriguésia* 66: 1085–1113.

Chodat, R.H. (1894) Polygalaceæ novæ vel parum cognitæ. *Bulletin de l'Herbier Boissier* 2: 167–174.

Marques, M.C.M. (1980) Revisão das espécies do gênero *Bredemeyera* Willd. (Polygalaceae) do Brasil. *Rodriguésia* 32: 269–321.

Pastore, J.F.B. (2010) *Bredemeyera hebeclada*, a new combination in Polygalaceae. *Novon* 20: 314–316.

Willdenow, C.L. (1801) Drei neue Pflanzen-Gattungen. *Neue Schriften der Gesellschaft Naturforschender Freunde zu Berlin* 3: 403–412.

CAPÍTULO 3. Three lonely Argentines: Toward a new generic delimitation in Polygalaceae

Artigo publicado na revista ***Taxon*** ISSN 0040-0262 (Qualis A2).

Three lonely Argentines: Toward a new generic delimitation in Polygalaceae

MICHELLE MOTA[1], J. RICHARD ABBOTT[2], ROBERTO M. SALAS[3], KURT M. NEUBIG[4], JOSÉ FLORIANO B. PASTORE[5]

[1]Programa de Pós Graduação em Botânica, Universidade Federal do Paraná, Av. Francisco H. dos Santos s.n., Campus do Centro Politécnico, 81531-980, Curitiba, Paraná, Brasil. e-mail: mcamota@outlook.com.

[2]School of Mathematical and Natural Sciences, The University of Arkansas at Monticello, Arkansas 71655, U.S.A.

[3]Instituto de Botánica del Nordeste, UNNE-CONICET, C.C. 209, 3400, Corrientes, Argentina; Facultad de Ciencias Exactas y Naturales y Agrimensura, UNNE, Corrientes, Argentina.

[4]Department of Plant Biology, Southern Illinois University Carbondale, 1125 Lincoln Drive, Carbondale, Illinois 62901, U.S.A.

[5]Universidade Federal de Santa Catarina, Campus Curitibanos, Rodovia Ulysses Gaboardi, km 3, Curitibanos, 89520-000, Santa Catarina, Brazil.

Abstract Three enigmatic lineages of the Polygalaceae endemic to the semi-arid region of Argentina were sampled within the framework of a molecular phylogenetic study of its genera. The regions nrITS, *matK*, the *trnL* intron, the *trnL-trnF* intergenic spacer, and *rbcL* were analyzed, and the history of some morphological characters was reconstructed in the family. Results of our phylogenetic analyses and morphological study support the recognition of three monotypic genera historically treated in the genera *Bredemeyera* and *Polygala*. A new genus, *Rhamphopetalum*, and a new combination, *Rhamphopetalum microphyllum*, are proposed together with resurrection of *Hualania* and *Monrosia*. The emergence of two species (*Bredemeyera colletioides* and *B. microphylla*) as new genera, resolves the polyphyletic status of *Bredemeyera*. Relationships and morphological characters among the genera of Polygalaceae are discussed. Provided here are photographic plates of *H. colletioides, M. pterolopha*, and *R. microphyllum* habits, with details of the floral structures, a distribution map, typifications, and taxonomic keys for the tribes of Polygalaceae and genera within the tribe Polygaleae.

Keywords *Bredemeyera*, *Hualania*, *Monrosia*, Phylogeny, *Polygala pterolopha*, *Rhamphopetalum*.

INTRODUCTION

Polygalaceae are a cosmopolitan family with about 1,200 species currently in 27 genera (Pastore & al., 2017). The family is monophyletic, divided at present into four tribes: Xanthophylleae Chodat, Diclidanthereae Reveal, Carpolobieae Eriksen, and Polygaleae Chodat. The tribe Polygaleae comprises 17 genera, characterized by a trimerous corolla (rarely also with 2 rudimentary lateral petals). Although the tribe is monophyletic, several changes in generic delimitation have been recently introduced to recognize only monophyletic genera, such as *Muraltia* DC. now including *Nylandtia* Dumort. (Forest & Manning, 2006). Most changes have been related to the genus *Polygala* L., which in its traditional circumscription was, at best, a paraphyletic grade out of which all other genera arose. Fortunately, most of the traditionally recognized subgroups within *Polygala* were shown to represent monophyletic lineages, just not closely related.

As delimited by Chodat (1893, 1896), *Polygala* is characterized by a capsule, often subtended by the persistent calyx, and seeds without a coma (i.e., a tuft of hairs). However, recent phylogenetic studies (Persson, 2001; Pastore & al., 2017) have shown that these characters are not synapomorphic for *Polygala*, also appearing in several other lineages formerly recognized as subgenera, most of which have already been segregated from *Polygala* L. (Pastore & al., 2010; Pastore, 2012; Pastore & Abbott, 2012; Pastore & Moraes, 2013; Abbott & Pastore, 2015).

Despite these studies in Polygalaceae, three distinct species (one *Polygala* and two *Bredemeyera* Willd.), all endemic to Argentina, were not yet sampled in phylogenetic studies or were poorly studied. The first one, *P. pterolopha* Chodat, is an enigmatic species with single-winged samaras resembling species of *Securidaca* L., whereas other species of the genus *Polygala* have capsules. The other two species, *Bredemeyera colletioides* (Phil.) Chodat and *B. microphylla* (Griseb.) Hieron, are thorny shrubs with very short racemes (resembling an axillary fascicle), whereas *Bredemeyera* are unarmed plants with panicles. Phylogenetic studies, based on plastid *trnL-F* and *rbcL*, recovered a polyphyletic *Bredemeyera* when including *B. colletioides* and *B. microphylla* (Persson 2001, Eriksen & Persson 2007, Forest & al., 2007, Pastore & al., 2017). Thus, segregate these species is necessary for the correct treatment of *Bredemeyera* as monophyletic.

Since Forest & al. (2007), that provides a genera key in Polygalaceae species, no other papers have emerged showing the current generic configuration of the family, after so many changes, especially in the tribe Polygaleae

Thus, we are revisiting the phylogeny of tribe Polygaleae to reconstruct the evolution of morphological characters and to clarify the phylogenetic relationships of these three Argentinian species by increasing the sampling and loci studied. We also provide a new generic delimitation, generic key for tribe Polygaleae, description and taxonomic notes for genera studied, typification of names involved, plates with morphological analyses, distribution maps, and ecological notes.

MATERIALS AND METHODS

Taxon sampling and DNA sequencing. — All genera of Polygalaceae were analyzed using at least two species per genus (Table 1), except for *Gymnospora* (Chodat) J.F.B.Pastore, *Heterosamara* Kuntze, and the monotypic genera *Balgoya* Morat & Meijden, *Barnhartia* Gleason, and *Eriandra* Royen & Steenis. Eight species (of 13 species, treated in Mota & al. *in prep.*) of *Bredemeyera s.l.* (with 13 separate accessions) were included.

Table 1. Species number in the Polygalaceae genera and species sampled.

Genus	Number of Taxa per genus	Number of taxa sampled
Acanthocladus Klotzsch ex Hassk.	7	2
Asemeia Raf.em. Small.	29	2
Atroxima Stapf	2	2
Badiera DC.	7	2
Balgoya Morat & Meijden	1	1
Banhartia Gleason	1	1
Bredemeyera Willd.	13	6
Caamembeca J.F.B.Pastore	13	2
Carpolobia G.Don	5	2
Comesperma Labill.	34	2
Diclidanthera Mart.	5	2
Epirixanthes Blume	7	2
Eriandra P.Royen & Steenis	1	1
Gymnospora (Chodat) J.F.B.Pastore	2	1
Hebecarpa (Chodat) J.R.Abbott	19	2
Heterosamara Kuntze	17	1
Hualania Phil.	1	1
Monnina Ruiz & Pav.	158	2
Monrosia Grondona	1	1
Moutabea Aubl.	9	3
Muraltia DC.	121	2
Phlebotaenia Griseb.	1	1
Polygala L.	583	7
Polygaloides Haller	6	2

Rhamphopetalum J.F.B.Pastore & M.Mota	1	1
Rhinotropis (S.F.Blake) J.R.Abbott	17	2
Salomonia Heist. ex Fabr.	5	2
Securidaca L.	56	2
Xanthophyllum Roxb.	110	2

Polygala, the large genus in the family with ca. 583 species, was 7 species sampled, including its three possible different lineages (two species from the large clades 'new world' and 'old world' and one from the subgenus '*Chodatia'*).

The monotypic genus *Monrosia* Grondona, formerly treated as *Polygala pterolopha* Chodat, was sampled for the first time in a phylogenetic study. Our analysis included 64 accessions of Polygalaceae, with 9 new accessions and 4 species sampled for the first time. DNA sequencing and analyses were similar to those of Pastore & al. (2017). Total genomic DNA was extracted from fresh or silica-gel dried leaf material (Chase & Hills 1991) and herbarium specimens. An adapted version of the Doyle and Doyle (1987) protocol for genomic DNA extraction or the DNeasy plant mini kit (Qiagen) extraction protocol were used. The nuclear ribosomal internal transcribed spacer region (nrITS, including both the nrITS1 and nrITS2, and the intervening 5.8S), the plastid 3'*trnK-matK* (including the partial *trnK* intron and *matK* coding region) and the *trnL-F* region (including the *trnL* intron and the *trnL-trnF* intergenic spacer) were amplified. The *matK/trnK* locus was amplified in two fragments, using primers matK4La/matK1932R, and matK1100L/trnK2R (Hu & al., 2000; Wojciechowski & al., 2004). Some *matK* sequences were amplified using the barcode primers 3F/1R (Fazekas & al., 2012). The whole *trnL-trnF* region was amplified using primers C and F, with the internal primers D and E for some problematic samples (Taberlet & al., 1991). The nrITS region was amplified using the primers 17SE and 26SE of Sun & al. (1994). The plastid loci were sequenced using the same set of primers used for the amplification, whereas the nrITS was sequenced using the internal primers ITS92 (Desfeux & Lejeune, 1996) and ITS4 (White & al., 1990) with the same PCR program. All PCR amplifications were performed in a final volume of 10 µL containing 5 µL of the TopTap master mix kit (Qiagen, Valencia, California), 2.25 pMol primers each, 5–10 ng of genomic DNA, and ultrapure H_2O (enough to complete the volume to 10 µL). For the nrITS amplification, 2% DMSO (dimethyl sulfoxide) and betaine were added to the final concentration of 1 M. The amplicons were amplified using an initial denaturation at 94°C (5 min), 28 (ITS) or 32 (plastid loci) cycles of denaturation at 94°C (1 min), annealing at 52°C (ITS) or 54°C (plastid loci) (1 min), elongation at 72°C (2 min), and a final elongation of 4 min. Amplified products were purified using precipitation with 11% solution of polyethylene glycol (PEG) 8000, followed by ethanol cleaning. Sequencing

reactions in both directions were performed at Universidade Estadual de Feira de Santana, Bahia, Brazil, with BigDye Terminator 3.1 chemistry (Applied Biosystems, Carlsbad, CA) and analyzed on an ABI3130XL sequencer (Applied Biosystems/Life Technologies Corporation) following the manufacturer's protocol. Some PCR products were sequenced at the Eurofins Genomics facility in Louisville, Kentucky, USA.

Alignment and Phylogenetic Analyses. — The electropherograms were edited and assembled using Geneious version 6.1.6 (Drummond & al., 2012). Sequences were automatically aligned in MUSCLE with the default settings (Edgar, 2004) and then manually adjusted in Geneious. Phylogenetic analyses of separate nrITS and plastid loci and combined plastid and nuclear DNA datasets were performed. The search for the most parsimonious trees was carried out using a heuristic search with 1,000 random taxon-addition replicates and TBR branch swapping, saving 10 trees per replicate. Trees saved in this first round were used as starting trees in a second search using the same parameters, but saving a maximum of 10,000 trees. All characters were considered equally weighted and unordered (Fitch 1971). Nonparametric bootstrap resampling (BS) implemented in PAUP* 4.0 beta 10 was used to estimate clade support (Felsenstein 1985) which was assessed through 1,000 bootstrap replicates, each analyzed using the heuristic search parameters mentioned above and with 10 trees per replicate retained.

Bayesian analyses were carried out using MrBayes v.3.1.2 (Huelsenbeck & Ronquist, 2001; Ronquist & al., 2012) through the Cyberinfrastructure for Phylogenetic Research (Cipres Science Gateway; Miller & al., 2010). The molecular evolution model was selected for each dataset using the Akaike Information Criterion as implemented in jModeltest 2 (Darriba & al., 2012). The best models were GTR + I + Γ for nrITS, GTR + Γ for plastid loci and SYM + Γ for 5.8S (ITS). Each dataset was partitioned according to these models in a combined analysis. Two separate runs of a Metropolis-coupled Markov Chain Monte Carlo (MCMC) permutation of parameters were initiated with a random tree and eight simultaneous chains set at default settings (Huelsenbeck & Ronquist 2001). Two runs in parallel of four MCMC for 2×10^6 generations, with trees sampled every 1,000th generation, were performed. The first 10^6 generations were discarded as burn-in. The 50% majority-rule consensus was calculated in MrBayes for assessing posterior probabilities. All Bayesian majority-rule consensus trees were visualized and partially edited in FigTree v.1.4 (Rambaut, 2012). Convergence of runs was assessed using Tracer v. 1.6 (Rambaut & al., 2014). MrBayes v3.1.2 was used to summarize

trees sampled from post burn-in generations in a majority rule consensus tree that included posterior probabilities (PP) as branch support estimates.

Plant material. — In addition to the *in situ* collections in Catamarca and La Rioja, Argentina, herbarium specimens from CESJ, CORD, CTBS, CTES, FMNH, MBM, SI, and SRFA were also analyzed. Photo equipment for the stereoscopic magnifying glass Leica CLS 100x was provided by the Plant Anatomy Laboratory of IBONE (Corrientes, Argentina). Corel® PHOTO-PAINT ™ X7 was used for imaging and image editing.

Analysis of the geographical distribution. — The phytogeographic regions proposed by Cabrera (1971), though his methodology has been questioned (Prado, 1991; Ribichich, 2002), is still the best approach for discussing occurrence areas for the endemic genera of Polygalaceae treated here. Cabrera (1971) established two phytogeographic regions for continental Argentina, the Antarctic and Neotropical, with the latter divided into three domains (Amazonian, Patagonian-Andean, and Chaco). Seven provinces are recognized for the Chaco Domain, with Del Monte Province including almost all known collections of *Hualania*, *Rhamphopetalum,* and *Monrosia* (Fig. 1).

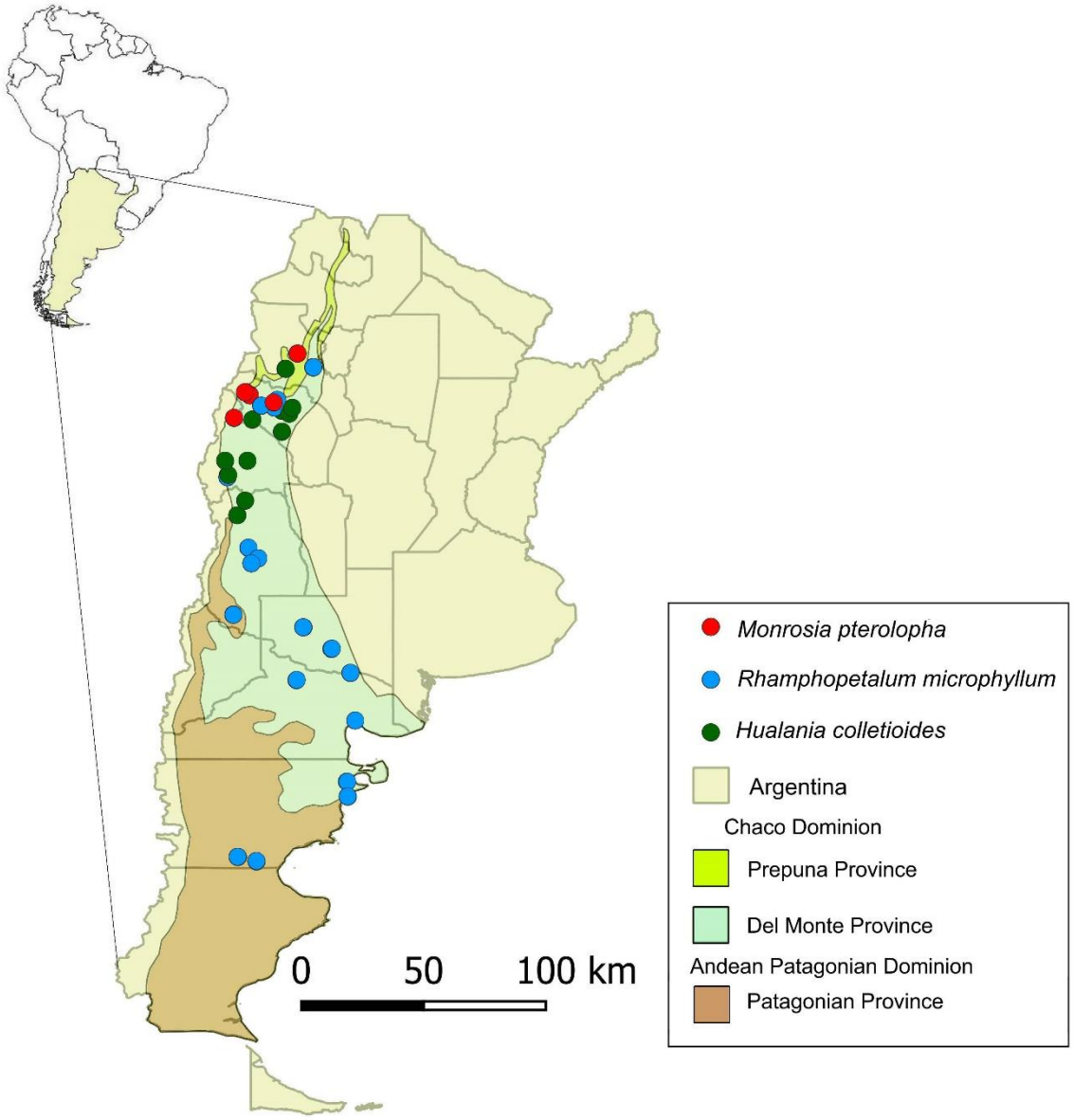


Figure 1: Distribuition map of *Hualania colletioides*, *Monrosia pterolopha* and *Rhamphopetalum microphyllum*.

Analysis of morphological characters. — The states of each character were mapped in the topologies of the concatenated tree topology using maximum parsimony method implemented in Mesquite v.3.51 (Maddison & Maddison, 2016). We estimated the history of character changes for seven characters (Table 2): habit (herb/subshrub/shrub/liana/tree), fruit pericarp (not fleshy/fleshy), fruit type (loculicidal capsule/samara/drupe/berry/legume/foraminicidal capsule), fruit wings (not winged/sub-winged/winged), fruit symmetry (asymmetrical/symmetrical), fruit dehiscence (Indehiscent/dehiscent), seed number (1 seed/ 2 seeds/ many seeds), seed caruncular elaiosomes (absent/present), seed coma (absent/present), sepals (caducous/persistent), thorns

(absent/present). The characters were classified based on species descriptions, observations of living specimens, herbarium collections, and literature (Eriksen & Persson, 2007, Meijden, 1982, Pastore & Moraes, 2013; Tsukaya & al. 2016; Pedley, 1984; Abbott, 2009, Paiva, 1998, Marques, 1984).

Table 2. Morphological character states of some representative species of the genera belonging to Polygalaceae.

Character	States	Comments
Habit	(0) Herb (1) Subshrub (2) Shrub (3) Woody vine (4) Trees	In this character we considered according to the branching of the stem and wooden. In woody vine are also considered scandent shrubs.
Fruit, pericarp	(0) Not fleshy (1) Fleshy	Fleshy pericarp is related to fruit drupe and berry, but sometimes it's associated with capsules (usually dry) as *Epirixathes* Blume.
Fruit, type	(0) Loculicidal capsule (1) Samara (2) Drupe (3) Berry (4) Legume (5) Foraminicidal capsule	The two capsule types were not grouped in the same state, because they have differences. In the loculicidal capsule, the fruit dehisces longitudinally through the locules, and the foraminicidal capsule (Non-capsular dehiscent fruit according to Knapp, 2002), the fruit has a thin pericarp, which cracks in an irregular fashion, thus leaving the seeds exposed at the senescent stage (see *X. octandrum*).
Fruit, wings	(0) Not winged (1) Sub-winged (2) Winged	Some species of Polygalaceae, have wings sub developed, these, are usually capsules with the flattened margins. The groups considered winged in fact, are in general, samaras-like.
Fruit, simmetry	(0) Asymmetrical (1) Symmetrical	
Fruit, dehiscence	(0) Indehiscent (1) Dehiscent	The dehisce of fruits in Polygalaceae is related with capsules, for exception of the genus *Phlebotaenia* (indehiscent capsules)
Seed, number	(0) 1 seed (1) 2 seeds (2) Many seeds	
Seed, caruncular elaiossomes	(0) Absent (1) Present	Caruncular elaiossomes (caruncle) are related with myrmecochory dispersal syndrome, this appendix contains lipids and proteins for the seed (Forest, 2007, Ridley 1930).
Seed, coma	(0) Absent (1) Present	Species with coma in the seeds present wind-dispersal syndrome, it works as a parachute-like structure.

Sepals	(0) Caducous (1) Persistent
Thorns	(0) Absent (1) Present

RESULTS

Phylogenetic analyses. — Ten accessions from eight of the 13 species of *Bredemeyera s.l.* produced 21 new sequences (9 of nrITS, 4 of *matK*, and 8 of *trnL-F*), with four species evaluated in a molecular phylogenetic analysis for the first time. The general structure of the tree in Fig. 2 is similar to that published by Pastore & al. (2017). No highly supported incongruent nodes found comparing plastidial and nuclear analyzes trees (Fig. 3).

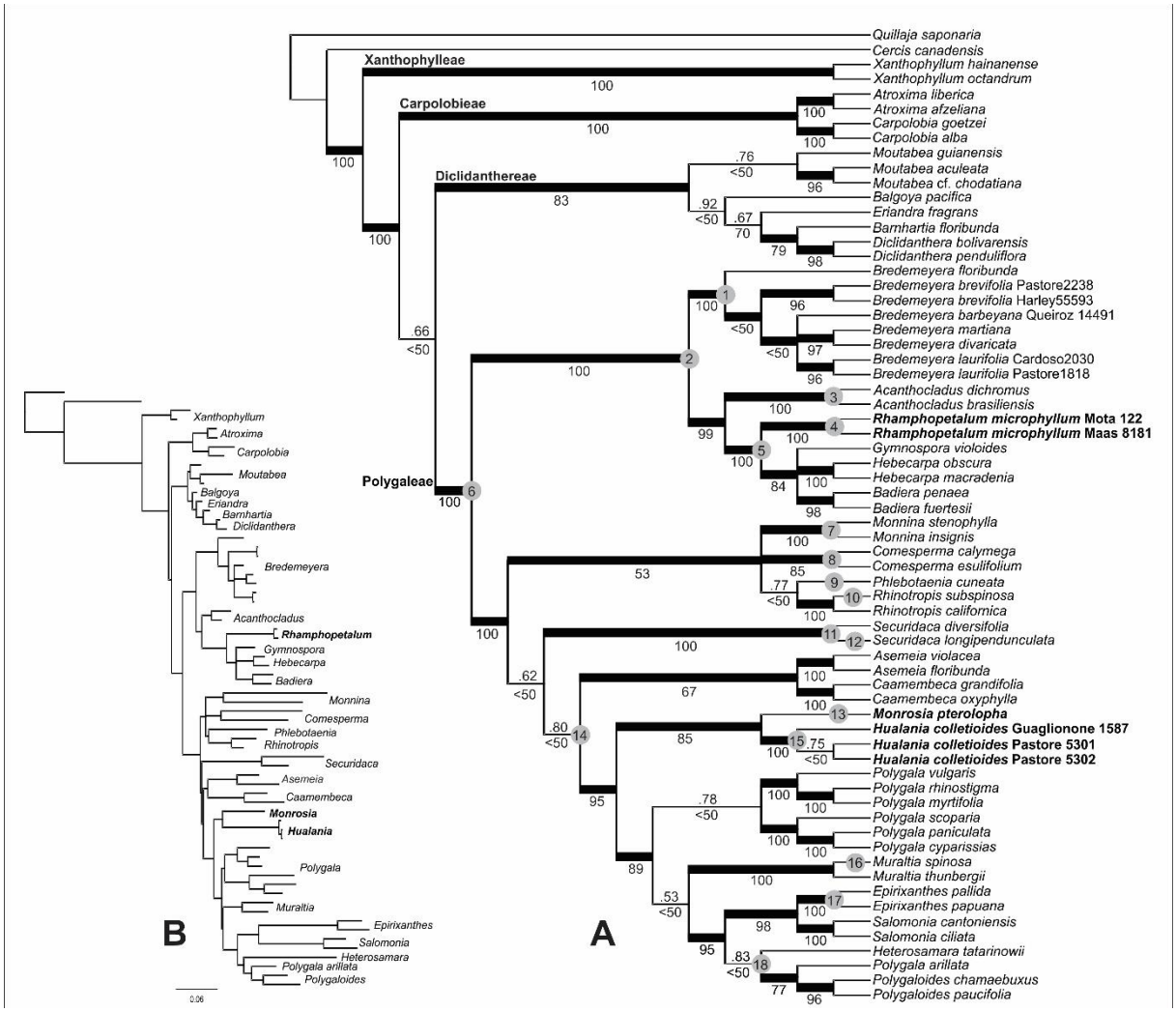


Figure 2: A. Majority-rule consensus tree from the Bayesian analysis of the combined nuclear (ITS) and plastid (*matK* + *trnL-F* + *rbcL*) datasets for Polygalaceae. Numbers above branches are posterior probabilities (in percentages), with PP=100 for branches in bold. Numbers below branches are bootstrap support (BS) values from

the Parsimony analysis; branches in bold without numbers have BS=100%. Discussed nodes in gray circles. B. Phylogram of branch lengths.

Phylogenetic relationships. — The phylogenetic trees corroborate the relationships in Polygaleae presented in previous studies (Persson, 2001; Pastore & al., 2017), based on a more extensive sampling of molecular markers. *Bredemeyera* forms a monophyletic group with 100% bootstrap support, with the exclusion of *Bredemeyera colletioides* and *Bredemeyera microphylla*. *Monrosia pterolopha* (=*Polygala pterolopha*, included here for the first time in a phylogenetic study) is well supported as sister to *Hualania colletioides* (formerly treated as *Bredemeyera colletioides*). *Rhamphopetalum microphylla* (formerly treated as *Bredemeyera microphylla*) is supported as sister to *Gymnospora, Badiera*, and *Hebecarpa.*

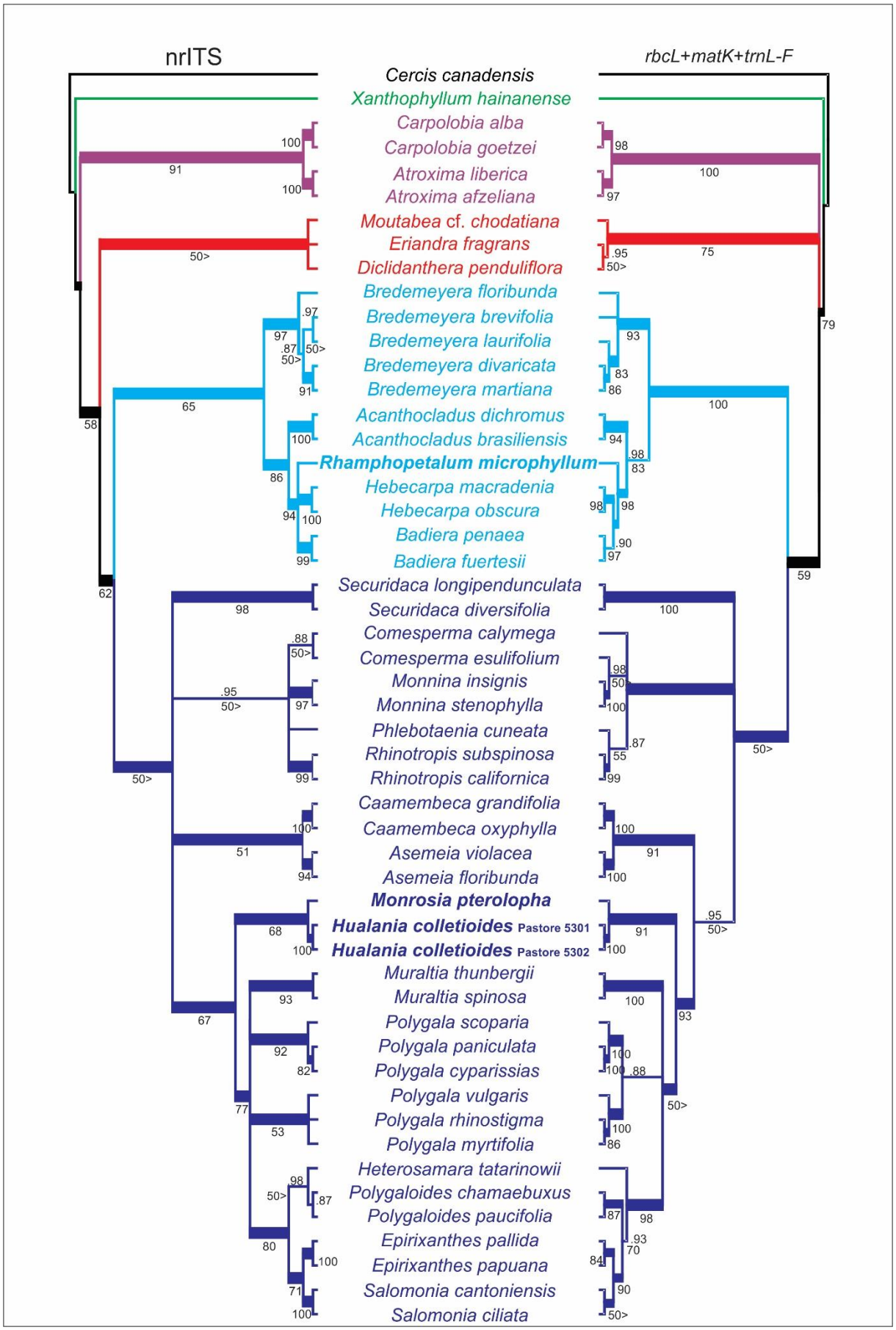


Figure 3: Majority-rule consensus trees from the Bayesian analysis of the nuclear (ITS) (left) and plastid (*matK* + *trnL-F* + *rbcL*) (right) datasets for Polygalaceae. Numbers above branches are posterior probabilities (in

percentages), with PP=100 for branches in bold. Numbers below branches are bootstrap support (BS) values from the parsimony analysis; branches in bold without numbers have BS=100%. Outgroup (black), Xanthophylleae Chodat (green), Carpolobiae Eriksen (purple), Diclidanthereae Reveal (red), *Bredemeyera* Willd. and allies (light blue), *Polygala* L. and allies (dark blue).

Morphological comparison and evolution in Polygalaceae. — The habit in Polygalaceae is variable from trees to herbs. The species in tribes Xanthophyllleae, Carpolobieae, and Diclidanthereae are trees, treelets, or woody lianas. In Polygaleae woody habit can be present in most genera, but only *Acanthocladus* can form well-developed trees (in some species), and several genera are entirely or predominately herbs, e.g., *Epirixanthes, Heterosamara, Polygala,* and *Salomonia*.

The presence of thorns (sharp branch tips) in Polygalaceae is restricted to tribe Polygaleae, although some *Moutabea* can have stipular spines at least when juvenile. Thorns seem to have independently evolved six times in the family (Fig. 2, nodes 2,3,7 and 8). The persistence of the calyx on mature fruit, once used in part to delimit the genus *Polygala* s.l., is restricted to tribe Polygaleae where it evolved twice (Fig. 2, nodes 4 and 9). However, there were reversals in *Hebecarpa* and the clade containing *Heterosamara/Polygala* subgenus *Chodatia/Polygaloides* (Fig. 2, node 12) to the calyx caducous in fruit.

The ancestral fruit type of Polygalaceae is likely a berry (and fleshy pericarp), as this feature is present in three of four tribes of Polygalaceae. The only exception (from Xanthophylleae) is *Xanthophyllum octandrum* (from the monotypic subgenus *Macintyria* (F.Muell) Meijden) which has an irregularly opening foraminicidal capsule. The berry likely evolved into a bilocular capsule without fleshy pericarp at the base of tribe Polygaleae. Then the capsular fruit changed to a one-seeded, one-winged (strongly asymmetrical) samara twice: in *Securidaca* and in *Monrosia,* with an independent origin of the one-seeded and two-winged samara found in some *Monnina.*

The number of seeds per fruit is variable in Polygalaceae. The seeds in *Xanthophyllum* (from monogeneric tribe Xanthophylleae) varies from 1–20, with most species developing 1 or 2 seeds (rarely 4) from 4 ovules. The number of seeds is also variable in tribes Diclidantherinae (1–)2–5(–6) and Carpolobieae (1–)2–3. The 2-seeded capsule is a synapomorphy of tribe Polygaleae, eventually reduced to one-seeded in *Monnina*, *Monrosia, Phlebotania*, and *Securidaca*. Fruit type has been traditionally an important feature to recognize genera in Polygalaceae. However, it is clear that fruits are not always supported as indicative of shared evolutionary history, e.g., drupes evolved separately within the genera *Monnina* and *Muraltia*

from dry fruits. The bilocular capsule, rather than indicating shared derived history, is recovered as a plesiomorphic feature in tribe Polygaleae.

The presence of a caruncle, a mechanism for attracting ants to disperse the seeds, is associated with a bilocular capsule and is likely a synapomorphy of the Polygaleae, in agreement of Forest & al. (2007). However, if the caruncle is a synapomorphy of Polygaleae (Fig. 2, nodes 5) it has been lost at least six times in different lineages of Polygaleae.

The presence of a coma on the seeds is also restricted to Polygaleae and evolved independently at least four times in the genera *Bredemeyera, Comesperma, Hualania*, and *Rhamphopetalum* (Fig. 2, nodes 1,3,6 and 10). This feature is also present in the morphologically enigmatic *Polygala papuana* which has not yet been sampled in any phylogenetic study.

DISCUSSION

The genera *Hualania, Monrosia*, and *Rhamphopetalum* are all endemic to Argentina (Fig. 1). *Rhamphopetalum* is the most widely distributed of the groups here. Its isolated phylogenetic position and distinctive morphology make it impossible to simply transfer this species into another genus, while maintaining monophyly. Despite support for *Hualania* and *Monrosia* as sister groups, i.e., forming a monophyletic group as each other's closest relatives, these genera share no known morphologic synapomorphies, so that lumping them together would result in a morphologically undiagnosable genus. Considering the phylogenetic analysis, and morphology it was suspicious the attraction of long branches effect. However, analysis excluding *Monrosia* or *Hualania* samples does not change the position of the genera. *Hualania* and *Monrosia* have similar geographic distribution.

Monrosia resembles the genus *Polygala* (in which *M. pterolopha* was originally described) only by the herbaceous habit, and it has single-winged samaras like *Securidaca*. *Hualania* resembles superficially *Acanthocladus* by the branches terminating in spines. These two sister groups differ from each other by fruit type (samaras in *Monrosia* vs capsules in *Hualania)*, inflorescences (racemes vs brachyblasts), leaves (persistent vs caducous), habit (herbaceous vs shrubs), and keel (with apical appendages vs appendages absent). Their isolated phylogenetic position and distinctive morphologies again make it impossible to simply subsume them within an existing genus.

We, therefore, propose to recognize these three lineages as monotypic genera in Polygalaceae, reestablishing *Hualania* and *Monrosia* and describing a new genus *Rhamphopetalum* (there was no available name for this taxon), thus increasing the total number

of genera in the family to 29, and monotypic genera to six. The alternative is to recognize non-monophyletic groups or to lump several distinctive lineages into a single, morphologically meaningless genus.

TAXONOMIC TREATMENT

Key to Polygalaceae tribes (adapted from Erikssen & Persson, 2007)

1 Corolla trimerous (rarely also with 2 rudimentary lateral petals)…...**Tribe Polygaleae**

1 Corolla pentamerous (never with 3 large petals & 2 tiny lateral petals)……..…….2

2 Ovary unilocular, many ovules per locule……..……**Tribe Xanthophylleae**

2 Ovary multilocular, one ovule per locule…….……..3

3 Stamens 6-10….……....…….....**Tribe Diclidanthereae**

3 Stamens 5…..……....……...…….....**Tribe Carpolobieae**

Key to Polygaleae genera

1. Fruit 1, 2, or 4-winged, New World distribution (except for a few *Securidaca*)……2
2. Fruit symmetric 2-winged samara…...…….***Monnina* Ruiz & Pav. (in part)**
2. Fruit strongly asymmetric 1, 2 or 4-winged samara or samaroid capsule …….3
3. Tree, 4-winged (2 large & 2 small) samaroid capsules, keel without appendages, not fringed, Cuba & Puerto Rico…...……..……*Phlebotaenia* **Griseb.**
3. Subshrub or woody liana, rarely shrub or treelet, 1-2 winged samara, keel with two reflexed orbicular appendages or with a fringed crest, widely in New World…… …4
4. Subshrub (*Polygala* like), keel with two reflexed orbicular appendages, not fringed, samara 1(-2) seeded, Argentina……...……...***Monrosia* Grondona**
4. Woody liana, rarely shrub or treelet, keel without appendages, crest fringed, samara strictly 1 seeded, widely distributed in Latin America (& with a few species in the Paleotropics), not occurring in Argentina……..……..***Securidaca* L.**
1. Fruit a bilocular capsule or a drupe, worldwide distribution.....5
5. Seeds comose (hairs often longer than seed)……..…….....6
6. Inflorescences panicles, coma funicular, restricted to small aril on the top of seed (funicular region)…….……..……..***Bredemeyera* Willd.**
6. Inflorescences racemes, sometimes with short internodes and resembling an axillary fascicle, or solitary axillary flowers, coma chalazial, not restricted to the top of seed 7

7. Plants unarmed, Australia.....***Comesperma* Labill.**

7. Plants armed with thorns, Argentina.....8

8. Lower external sepals free, capsules glabrous, lateral petals not included within the keel, leaves caducous.....***Hualania* Phil.**

8. Lower external sepals connate, capsules tomentose, lateral petals included within the keel, leaves not caducous.....***Rhamphopetalum* J.F.B.Pastore & M.Mota**

5. Seeds lacking a coma, usually with short trichomes (almost always shorter than seed) or glabrous…….…….9

9. Calyx deciduous in fruit 10

10. Fruit a drupe …….....….……*Monnina* **Ruiz & Pav. (in part)**

10. Fruit a bilocular capsule.…….....…11

11. Keel ecristate, New World.…….……12

12. Shrubs 2 m or more tall (rarely flowering when smaller); lateral sepals reduced, green; fruits thick-walled (coriaceous); seeds persistent after capsule dehiscence; arils bright orange-red……*Badiera* **DC.**

12. Herbs (but often suffrutescent) usually less than 1 m tall; lateral sepals expanded, petaloid; fruits thin-walled; seeds readily-falling at capsule dehiscence; arils white.....***Hebecarpa* (Chodat) J.R.Abbott**

11. Keel cristate, Old World (except 1 sp. of *Polygaloides* in North America; Note: it is not yet clear whether the putative morphology mentioned here represents reciprocally monophyletic clades)…….…..…….……13

13. Keel with a bilobate crest; pollen heteropolar…..…….……..…*Heterosamara* **Kuntze**

13. Keel with a plurilobate crest; pollen isopolar……..…14

14. Petioles 1-1.5 cm long ……..……*Polygala* **subgen.** ***Chodatia* Paiva**

14. Petioles nearly lacking to 4 mm long...……..*Polygaloides* **Haller**

9. Calyx persistent in fruit.....15

15. Achlorophyllous annual herbs……...……*Epirixanthes* **Blume**

15. Chlorophyllous herbs (annual to perennial) and shrubs…….....…….16

16. Fruit a drupe or horned capsule, flowers axillary, solitary.....***Muraltia* DC.**

16. Fruit a capsule lacking horns (margin sometimes fringed), flowers in racemes (rarely also with reduced axillary clusters)……...17

17. Capsule margins fringed with sharp teeth, Australasia……..***Salomonia* Lour.**

17. Capsule margins almost always entire (often apically emarginate; rarely slightly crenate or shallowly undulate, but not fringed with sharp teeth), worldwide ……....18

18. Flowers with keel crested ……***Polygala* L.**
18. Flowers with keel ecristate (but often 3-lobate)…….19
19. Lower external sepals connate (the resulting structure often bilobate.....***Asemeia* Raf. emend. Small.**
19. Sepals all free, none bilobate.…….20
20. Stipular nectaries on stem at base of petiole (& usually subtending flowers); external sepals glabrous or sparsely puberulous; seeds arillate……....***Caamembeca* J.F.B.Pastore**
20. Nectaries lacking on stem (& in inflorescence); external sepals densely puberulous; seeds exarillate…….....***Gymnospora* (Chodat) J.F.B.Pastore**

I. *Hualania* Phil. in Annal. Univ. Chil. 21: 390. 1862 – Type: *Hualania colletioides* Phil. ≡ *Bredemeyera* sect. *Hualania* (Phil.) Chodat in Nat. Planzenfam. [Engler & Prantl] 3(4): 338. 1896.

Diagnosis – The genus is hereby reestablished and distinguished from *Bredemeyera* Willd., with which it had been synonymized since 1896. *Hualania*, as here circumscribed, differs from *Bredemeyera* by inflorescences forming brachyblasts (short shoots), stems terminating in spines, and caducous leaves (lacking at maturity).

1. *Hualania colletioides* Phil. in Annal. Univ. Chil. 21: 390. 1862. ≡ *Bredemeyera colletioides* (Phil.) Chodat, Nat. Planzenfam. [Engler & Prantl] 3(4): 338. 1896. – Type: ARGENTINA, Mendoza, Maipu, Lulunta, *W. Diaz s.n.* (Lectotype, here designated: SGO000002975).

Description. – Shrubs, 2--3 m tall, densely branched, cylindrical, stems terminating in spines, young branches flexible; leaves 1--3 × 1 mm, sessile, caducous, triangular, apex acuminate, margin entire, both surfaces glabrous. Brachyblasts congested, 2--4 mm long; pedicel 3 mm long, glabrous. Flowers white, 7 mm long; external sepals 2 × 1 mm, apex rounded, both surfaces glabrous, margin ciliate in the basal portion, persistent in fruit; internal sepals 3 × 2 mm, apex rounded, glabrous internally, sparsely pubescent externally; keel 3.5 × 2 mm, glabrous, not cristate, appendages absent, claw 2 mm long, glabrous; lateral petals 4 × 1 mm, asymmetrical, apex acute, with a lilac tinge, glabrous externally, pubescent on medial ventral portion internally, not included within the keel; filament sheath 4 × 3 mm, glabrous, margin ciliate, free portion of filaments 1 mm, glabrous, connective expanded; rudimentary petal 0.3 × 0.3 mm, orbicular, glabrous; style 3.5 mm, curved, glabrous; stigma barely

emarginate; ovary 1.1 × 1 mm, glabrous, oblong. Capsules 1.5 × 0.3 mm, obovate, glabrous, brownish when mature, seeds 8 (13 mm with the trichomes) × 2 mm, pubescent the whole length. Figs. 4, 5 E--H.

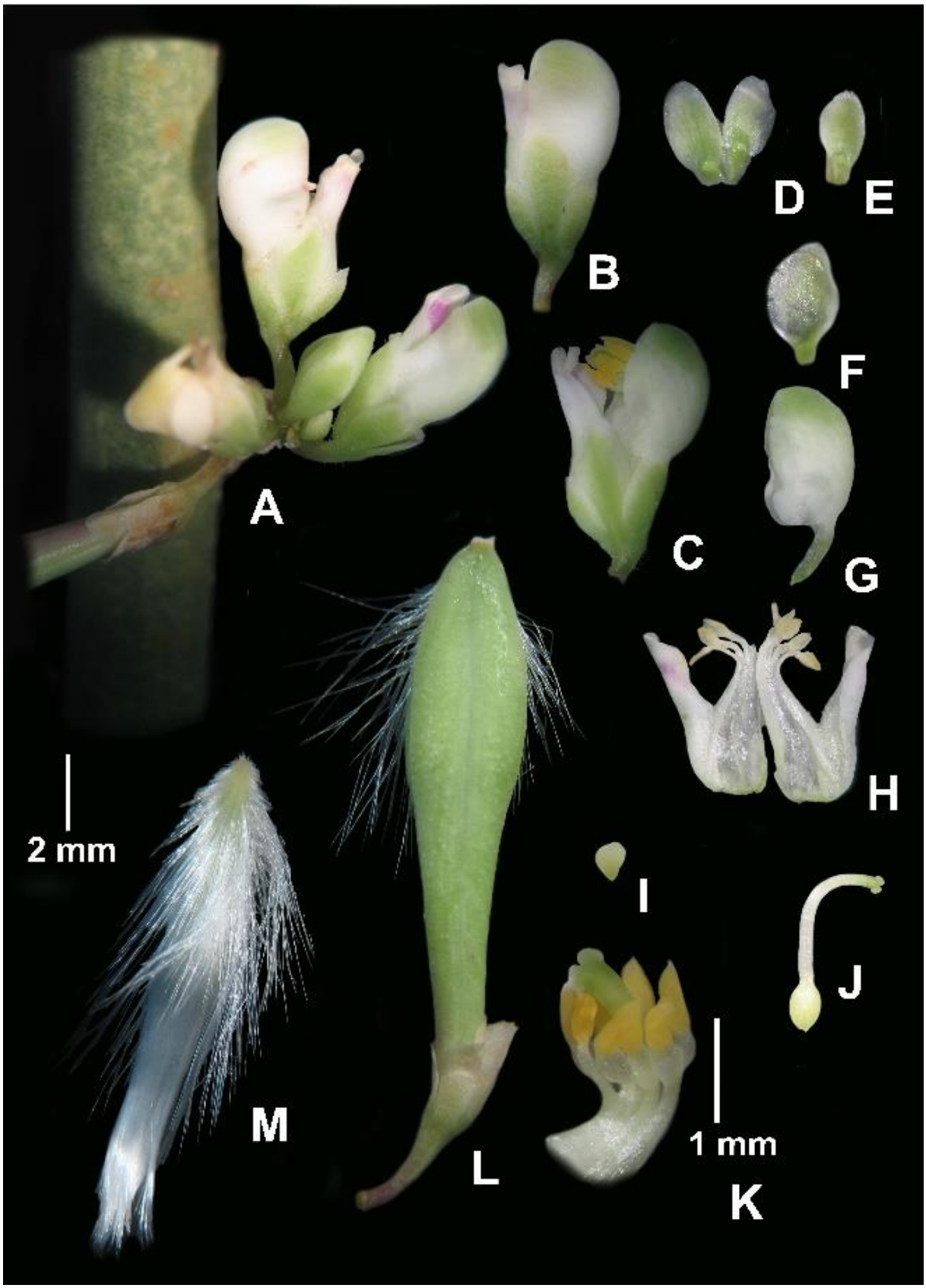


Figure 4: *Hualania colletioides*. A. Stem with inflorescence; B. & C. Flowers, side view; D, E. External sepals; F. Internal sepal (wing); G. Keel, lateral view; H. Androecium and lateral petals; I. Rudimentary petal; J. Gynoecium; K. Detail of anthers; L. Capsule; M. Seed. (*J.F.B. Pastore & al. 5301*).

Distribution and Ecology: – Hualania colletioides is remarkably adapted to dry areas being restricted to the Del Monte province, in Catamarca, La Rioja, Mendoza, and San Juan, from 27° to 33° S. It occurs at 1,400–1,575 m a.s.l., usually growing along seasonal rivers, and producing odoriferous flowers and fruits during the dry season. All known specimens of *Hualania colletioides* were collected in Del Monte Province, in open forests of "Algarrobo", with *Bulnesia schickendantzii* Hieron. (Zygophyllaceae) and the legume species *Cercidium praecox* (Ruiz & Pav. ex Hook.) Harms, *Prosopis chilensis* DC., *Prosopis flexuosa* (Molina) Stuntz, and *Senna rigida* (Hieron.) H.S. Irwin & Barneby, representing the dominant vegetation along seasonally dry rivers. The authors found red ants (Formicidae), treehoppers (Membracidae), and spiders (Arachnida) cohabiting on the plants.

Phenology: – Hualania colletioides was collected in flower and fruit between November and March, occasionally in September.

Additional specimens examined: – ARGENTINA. Catamarca, Belén, Quebrada de Belén, Mar 1879, *F. Schickendantz 87* (CORD); Tinogasta, entre Tinogasta e Fiambalá, 27º52'33.6"S, 67º40'50.8"W, 1488 m, 21 Jan 2017, *J.F.B. Pastore & al. 5301* (CTBS, CTES, UFPR). La Rioja: Chilecito, entre Nanogasta y Chilecito, Jan 1879, *G. Hieronymus & G. Niederlein, 178b* (CORD); Gral. Lavalle, al NO de Villa Unión, Nov 1915, *Hossens 1385* (CORD). Mendonza: Las Heras, 25-28 Feb 1900, *F. Kurtz 10883* (CORD). San Juan: Calingasta, Precordillera entre Barreales, Tontal y Retamito, Nov 1897, *F. Kurtz 9776* (CORD).

Diagnostic characters: – Hualania colletioides may be distinguished by the greenish photosynthesizing leafless stems (with tiny leaves when very young) and branches terminating in thick spines, and remarkable leathery epidermis providing protection against desiccation. In his anatomic study Schwabe (1947) refers to the crypt stomata in the epidermis of *H. colletioides* reducing water loss. These characters are shared by other plant species of the phytogeographic region of Prepuna.

Figure 5: A--D, *Rhamphopetalum microphyllum*. A. & B., Habit; C., Fruit; D., Flower. E.—H., *Hualania colletioides.* E., Habit; F., Inflorescence; G., Fruits; H., Leaves in early branch. (B. Photos by J.F.B. Pastore; A. & C.--D. Photos by Roberto Salas).

II. *Monrosia* Grondona in Darwiniana 8: 411. 1949 – Type: *Monrosia pterolopha* (Chodat) Grondona. (≡ *Polygala pterolopha* Chodat).

Diagnosis: – The genus *Monrosia* can be distinguished by the calyx persistent in fruit (a retained ancestral feature), indehiscent single-winged capsule with one or two seeds, and seeds with a very thin integument.

1. *Monrosia pterolopha* (Chodat) Grondona in Darwiniana 8: 412. 1949 ≡ *Polygala pterolopha* Chodat Mém. Soc. Phys. Genève 2(2): 301. 1893 – Holotype: Argentina, La Rioja, Las Cortaderas inter Yaguel et el Peñon, [Cortaderas, between Jaguë and El peñon (in Catamarca)], Cordillera de la Rioja, 27 Feb 1879, *Hieronymus & Niederlein 247* (COR barcode CORD00003060!).

Description. – Prostrate subshrubs, to 10 cm, with several branches, the base woody and glabrous, distally herbaceous and tomentose, stems not terminating in spines, young stems green; leaves all alternate, petioles ca 1 mm, lamina 6.4--9 × 2--3.4 mm, elliptic to oval-elliptic, base obtuse, margin entire, thickened, apex rounded, both surfaces pubescent. Racemes terminal, ca 8 mm long, bracts caducous with the flowers, 1 × 0.5 mm, sub-elliptic, glabrous or sparsely puberulent externally, bracteoles 0.8 × 0.3 mm, narrowly elliptic, apex obtuse, glabrous; pedicel ca 2 mm long, glabrous. Flowers 7 mm long; calyx white, persistent in fruit; external sepals glabrous, sparsely ciliate on the margins, not connate, the lower ones 2 × 1--1.1 mm, elliptic, the upper one 2 × 1.3 mm, ovate, wings (internal sepals) 4.7 × 2.8 mm, elliptic, both surfaces glabrous, keel ca 4 × 2.3 mm, hooded, glabrous, not cristate, with two apical orbicular appendages reflexed, claw 2 mm long, glabrous; lateral petals ca 4 × 0.6--0.7 mm, asymmetrical, apex rounded, externally glabrous, inner surface pubescent in medial ventral portion, not included within the keel; filament sheath ca 3 mm, both surfaces glabrous, free portion of filaments 0.3 mm; style 2.3 mm, curved, widest distally; ovary ca 1 × 0.6 mm, oblong, puberulous, asymmetric. Samara single-winged, indehiscent, one-, rarely two-seeded, 4–5 × 2.3 mm, curved, pubescent, brownish when mature, reticulate, seeds pyriform, 2.7 × 1.1 mm, sparsely puberulous with short trichomes, without apical aril. Fig. 6.

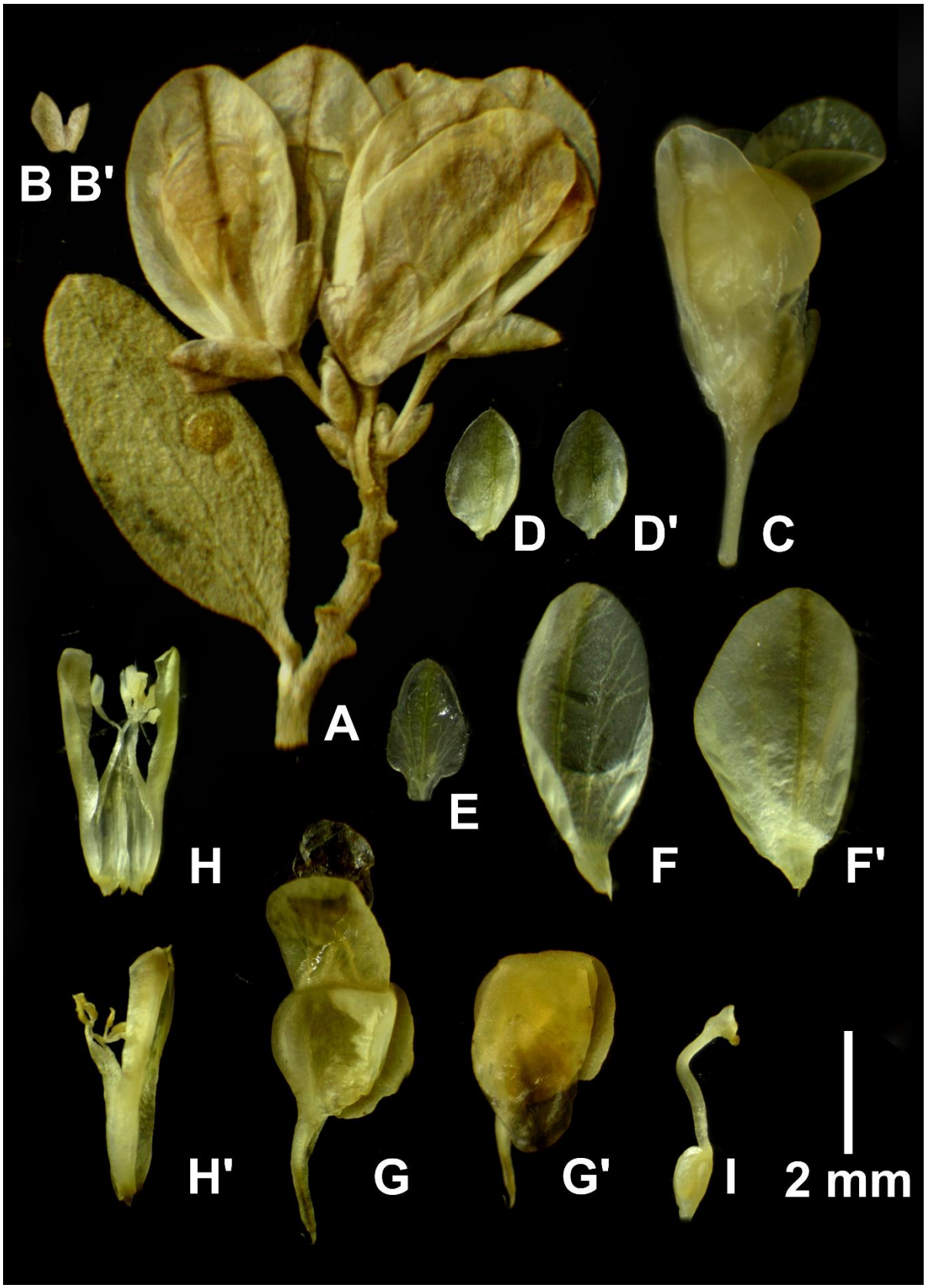


Figure 6: *Monrosia pterolopha*. A. Raceme; B., B'. Bract and Bracteole; C. Flower, side view; D., D'. Lower external sepals in front and back views; E. Upper external sepal, front view; F., F'. Wing (internal sepal) in front and back views; G., G' Keel, lateral view; G., G'. Androecium and lateral petals in front and lateral views; I. Gynoecium (*G.E. Barbosa 4260* CORD).

Distribution and Ecology: – Perennial plants restricted to the Argentinian provinces of Catamarca, La Rioja, and San Juan, from 27° to 29°S, at 2,000 to 3.000 m a.s.l. According to Cabrera's phytogeographical regionalization, specimens of *Monrosia pterolopha* were collected in Del Monte and Prepuna provinces, characterized by scrubby vegetation (with dispersed shrubs, Poaceae, such as *Jarava leptostachya* (Griseb.) F. Rojas and *Munroa argentina* Griseb., and some denuded areas), and by xerophilous scrubby steppe (with *Agrostis breviculmis* Hitchc.).

Phenology: – Monrosia pterolopha has been collected fertile between January and April.

Additional specimens examined: – ARGENTINA. Catamarca: Belén, Laguna Blanca, 27°05'11"S, 66°53'37"W, 30 Mar 2004, *B. Ruthsatz & B. Erschbamer s.n.* (MERL 3470). La Rioja: General La Madrid, 3300 m., 28°30'23"S, 68°47'51"W, 24 Jan 2012, *F.O. Zuloaga & al. 13757* (MO, SI); Famatina. Entrada a Los Pesebres (ladera este), viniendo desde La Mejicana. 28°52'37"S, 67°41'37"W, 2 Apr 2014, *G.E. Barbosa & al. 4260* (CORD): Vinchina, Punta de Água, 2600 m, entre Jaguë y Las Cortaderas, ca. 28°36'S, 68°39'W, 31 Jan 1947, *Monrós s.n.* (CORD *ex* Herb. Juan H. Hunziler 2072). San Juan: Iglesia, Parque Nacional San Guillermo, camiño desde La Palca a Quebrada de la Alcaparrosa, 29°27'19"S, 69°13'28"W, 3203 m., 27 Jan 2013, *L. Salomón & al. 15* (SI).

Taxonomic comments: – The genus *Monrosia* was established by Grondona (1949), who later seemed to reconsider this generic concept, having annotated in 1980 the *Monrós* s.n. specimen, previously identified by him as '*Monrosia pterolopha'*, as '*Polygala pterolopha*', but without having formally synonymized *Monrosia* to *Polygala.*

III. *Rhamphopetalum* J.F.B.Pastore & M.Mota, **gen. nov.** – Type: *Rhamphopetalum microphyllum* (Griseb.) J.F.B.Pastore & M.Mota (≡ *Acanthocladus microphyllus* Griseb.).

Diagnosis: – *Rhamphopetalum* may be recognized by the branches terminating in spines, yellow keel and the apex of lateral petals, lower external sepals connate, and laterally curved fruits.

Etymology. – The generic name refers to the shape of joined apices of the lateral petals resembling that of a bird's beak ("ράμφος", beak, and "πέταλο", petal).

1. *Rhamphopetalum microphyllum* (Griseb.) J.F.B.Pastore & M.Mota, **comb. nov**. ≡ *Acanthocladus microphylla* Griseb. in Abh. Königl. Ges. Wiss. Göttingen 24: 24. 1879

≡ *Bredemeyera microphylla* (Griseb.) Hieron. in Roca, Exped. Rio-Negro ii.: 182. 1881 ≡ *Polygala chodatiana* A.W. Benn. in J. Bot. 33: 109. 1895. – Holotype: ARGENTINA, Mendonza Las Peñas, Sierra del Tunuyan, *F. Kurtz 5424* (K barcode K000590911).

= *Bredemeyera fruticulosa* Kassau in Beitr. Syst. Polygalaceengattungen Berücksichtigung Vorkommens Saponin: 37. 1931. – Lectotype, designated here: ARGENTINA. La Rioja: General La Madrid, Cordón de Punilla, cerca Leoncito, *Hosseus 1086* (CORD barcode CORD00003038!).

= *Bredemeyera microphylla* var. *adpressa* Norverto & R.L.Pérez-Mor. in Bol. Soc. Argent. Bot. 26: 232, f. 1, B, C. 1990 – Holotype: ARGENTINA. La Pampa: Lihuel Calel, *Cano & Montes 68* (BAB barcode BAB00000618).

Description. – Shrubs, 15--50 cm, branches intensely green to greyish, tomentose, stems terminating in spines, young stems green; leaves all alternate, sessile, coriaceous, lamina 4--8 × 1--2 mm, elliptic to obovate, base acute, margin entire, apex attenuate to rounded, both surfaces tomentose. Racemes short, 2--3 mm long, 1--2(--3)-flowered, sometimes forming groups resembling panicles, bract 2 × 1 mm, oval, puberulous, bracteoles 1 × 0.3 mm, narrowly oblong, apex rounded, densely puberulous; pedicel ca 2 mm long, elongating up to 4 mm in fruit, pubescent. Flowers 5 mm long; calyx white, external sepals 2 × 1 mm, ovate, lower ones connate, pubescent on both surfaces, with glands at margins, persistent in fruit; wings (internal sepals) 4 × 2.5 mm, suborbicular, pubescent externally, glabrous internally, except for a pubescent line medially, deciduous in fruit; keel ca 2.5 × 2 mm, hooded, not cristate, appendages absent, glabrous, claw 1.5 mm long, glabrous; lateral petals ca 3 × 1 mm, asymmetrical, apex acuminate, externally glabrous, inner surface pubescent in the medial ventral portion, included within the keel; filament sheath ca 4 × 2 mm, glabrous on both surfaces, free portion of filaments 1 mm; style 2.5–3 mm, bended, widest distally; ovary 1.5 × 1 mm, oblong, pubescent. Capsules 1--1.2 × 0.4 cm, obovate, laterally curved, tomentose, brownish when mature, seeds 6 × 2 mm (8 mm long with the trichomes), pubescent the whole length, apex with a tuft of short trichomes; aril apical. Figs. 5 A—D, 7.

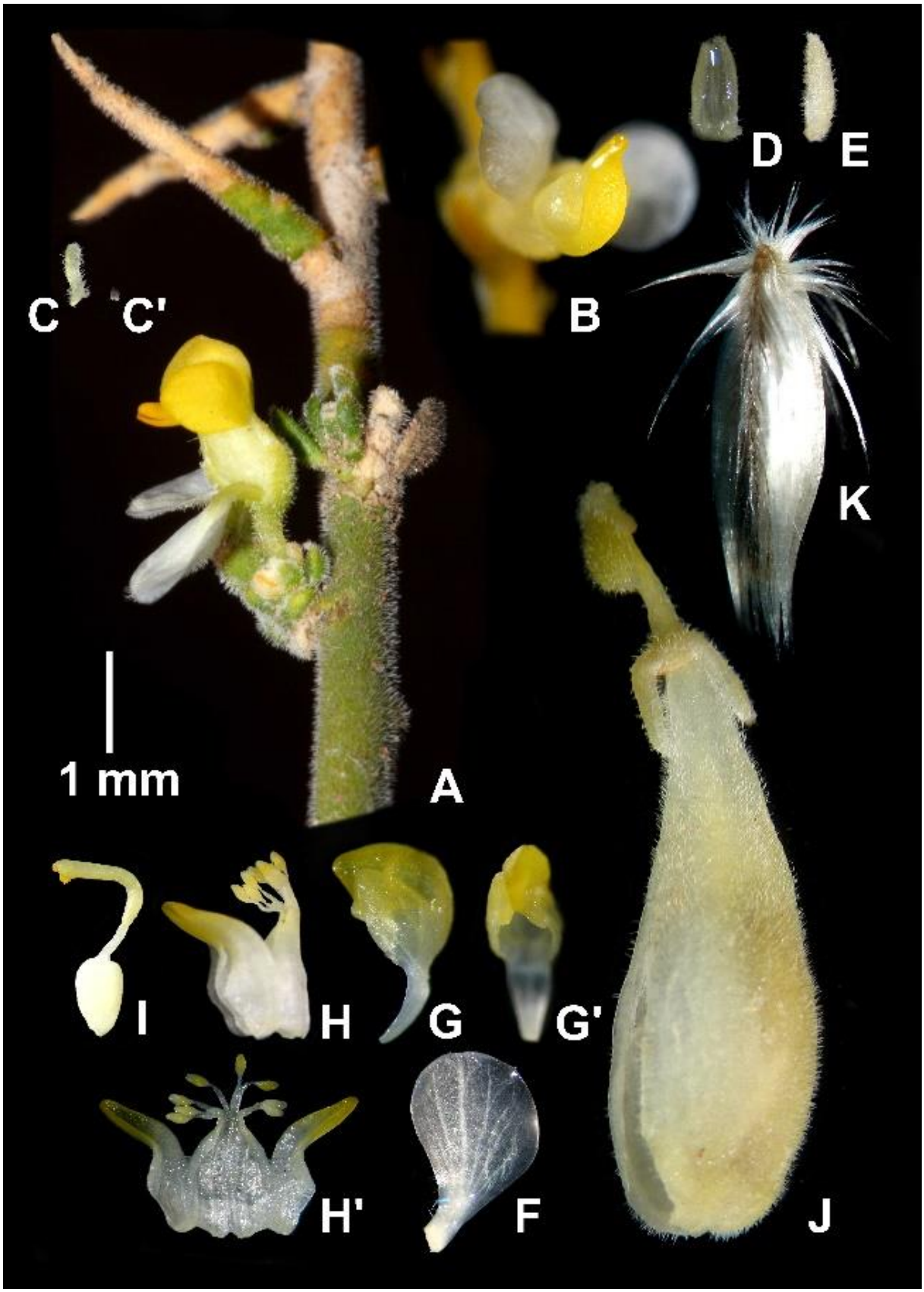


Figure 7: *Rhamphopetalum microphyllum*. A. Stem with inflorescence; B. Flower; C. Bract; C'. Bracteole; D. Upper external sepal; E. Lower external sepal; F. Wing (internal sepal); G. Keel, lateral view; G'. Keel, front view; H. Androecium; H'. Androecium and lateral petals; J. Capsule; K. Seed. (*M.C.A. Mota & al. 122*).

Distribution and Ecology: – The species occurs in the provinces of Catamarca, Chubut, La Pampa, La Rioja, Mendoza, Neuquén, and San Juan, with the distribution ranging from 27° S in Catamarca to 45° S in Chubut. According to Cabrera's phytogeographical regionalization, the species occurs in del Monte (Chaco) and Patagonia (Andean-Patagonia). Most collections are from Del Monte Province, in a vegetation known locally as "Jarillal", comprised of three dominant species of *Larrea* Cav. (*L. cuneifolia* Cav., *L. divaricata* Cav., and *L. nitida* Cav.; Zygophyllaceae). They are 1-2 m tall shrubs, growing dispersed on rocky and sandy soils of sedimentary origin, with some areas denuded. Specimens were found by the authors at 3,100 m, occasionally on the banks of dry rivers.

Phenology: – *Rhamphopetalum microphyllum* has been collected in flower and fruit between October and March.

Additional specimens examined: – ARGENTINA. Chubut: Rawson, Magaña, Nov 1994, *A. Forcone 157* (CORD). La Pampa: Limay Mahuida, Ruta Provincial 20, km 135, 21 Dec 1999, *G. Seijo 2145* (CTES). La Rioja: Famatina, entre El Pesebre y Corrales, 28º49'49.6"S, 67º40'57.7"W, 23 Jan 2017, *M.C.A. Mota & al. 122* (CTBS, CTES, UPCB). Mendonza: Malargue, Bordo Alto del Payun, 36º41'8"S, 69º14'51"W, 12 Dec 2004, *A. Prina & al. 2563* (SRFA). Neuquen: Zapala, Cerro Lotena, 39° 7'16.57"S, 69°44'31.03"W, San Juan: Calingasta, Precordillera entre Barreales, Tontal y Rentamito, Feb 1897, *F. Kurtz 28* (CORD).

Taxonomic comments: –Although the protologue of *Bredemeyera fruticulosa* Kassau cites the specimens *Hosseus 1086, 1220*, and *1063,* only the first of them, CORD [00003038] was located, with the tag stating that the other cited specimens were not in the herbarium collection.

Acknowledgments

The authors thank Dr. Ana Maria Gonzalez of the IBONE Plant Anatomy Laboratory for providing photographic equipment for making the dissecting scope images and the curator Gloria Barbosa and staff of the CORD herbaria, Javier and Mariela Florentin, Marina Judkevich from CTES herbaria, for all the support and the reviewers for the suggestions. The author JFBP thanks CNPq for fellowship support (302452/2017-6). The authors also thank Alex Popovkin for the English review.

Author Contributions

JFBP, MM, and RMS conducted field work for this study; JFBP and KN performed lab work to generate DNA sequence data; MM and JFBP performed the computational analyses for phylogenetic inferences and produced the figures; MM, JFBP, JRA, and RMS wrote the article with input of all authors.

Literature cited

Abbott, J.R. 2009. *Revision of Badiera (Polygalaceae) and phylogeny of the Polygaleae.* Ph.D. Dissertation, University of Florida, Gainesville, Florida, U.S.A.

Abbott, J.R. & Pastore, J.F.B. 2015 Preliminary synopsis of the genus *Hebecarpa* (Polygalaceae). *Kew Bull.* 70: 1--8. https://dx.doi.org/10.1007/s12225-015-9589-2

Cabrera, Á.L. 1971. Fitogeografía de la República Argentina. *Bol. Soc. Argent. Bot.* 14: 1--42.

Chase, M.C. & Hills, H.H. 1991. Silica gel: an ideal material for field preservation of leaf samples for DNA studies. *Taxon* 40: 215--220. https://dx.doi.org/10.2307/1222975

Chodat, R.H. 1893. Monographia Polygalacearum. *Mém. Soc. Phys. Genève* 31: 1--500.

Chodat, R.H. 1896. Polygalaceae Pp. 323--345 in: Engler, A. & Prantl, K. (Eds), *Die Natürlichen Pflanzenfamilien* vol. 3(4). Leipzig: Engelmann.

Darriba, D., Taboada, G.L., Doallo, R. & Posada, D. 2012. JModelTest 2: more models, new heuristics, and parallel computing. *Nature Methods* 9: 772. https://dx.doi.org/10.1038/nmeth.2109

Desfeux, C. & Lejeune, B. 1996. Systematics of Euromediterranean *Silene* (Caryophyllaceae): evidence from a phylogenetic analysis using ITS sequences. *C. R. Acad. Sci.* 3: 319: 351--358.

Doyle, J.J. & Doyle, J.L. 1987. A rapid DNA isolation method for small quantities of fresh tissues. *Phytochemical Bulletin* 19: 11--15.

Drummond, A.J., Ashton, B., Cheung, M., Heled, J., Kearse, R., Moir, S., Stones-Havas, Thierer, T. & Wilson, A. 2012. *Geneious*, *version 6.1.6.*

Edgar, R. 2004. MUSCLE: multiple sequence alignment with high accuracy and high throughput. *Nucl. Acids Res.* 32: 1792--1797. https://dx.doi.org/10.1093/nar/gkh340

Eriksen, B. & Persson, C. 2007. Polygalaceae. Pp. 345--363 in: Kubitzki, K. (ed.), *Fam. & Gen. Vasc. Pl.* vol. 5 (IX Flowering Plants, Eudicots.). Berlin: Springer.

Fazekas, A.J., Kuzmina, M.L., Newmaster, S.G. & Hollingsworth. P.M. 2012. DNA barcoding methods for land plants. Pp. 223--252 in: Kress, W.J. & Erickson, D.L. (eds.), *Methods in Molecular Biology 858: DNA Barcodes: Methods and Protocols*. Totowa: Humana Press.

Felsenstein, J. 1985. Confidence limits on phylogenies: an approach using the bootstrap. *Evolution* 39: 783--791. https://dx.doi.org/10.1111/j.1558-5646.1985.tb00420.x

Fitch, W.M. 1971. Towards defining the course of evolution: minimum change for a specific tree topology. *Syst. Zool.* 20: 406--416. https://dx.doi.org/10.2307/2412116

Forest, F., Chase, M., Persson, C., Crane, P.R. & Hawkins. J.A. 2007. The role of biotic and abiotic factors in evolution of ant-dispersal in the milkwort family (Polygalaceae). *Evolution* 61: 1675--1694. https://dx.doi.org/10.1111/j.1558-5646.2007.00138.x

Forest, F. & Manning, J.C. 2006. Evidence for inclusion of South African endemic Nylandtia in Muraltia (Polygalaceae). *Syst. Bot.*, 31: 525--532.

Grondona, E.M. 1949. "*Monrosia*", nuevo género de Poligaláceas. *Darwiniana* 8: 411--414.

Hu, J.M., Lavin, M., Wojciechowski, M.F. & Sanderson, M.J. 2000. Phylogenetic systematics of the tribe Millettieae (Leguminosae) based on chloroplast *trnK*/*matK* sequences and its implications for evolutionary patterns in the Papilionoideae. *Amer. J. Bot.* 87: 418--430.

Huelsenbeck, J.P. & Ronquist, F. 2001. MrBayes: Bayesian inference of phylogeny. *Bioinformatics* 17: 754--755.

Knapp, S. 2002. *Solanum* section *Geminata* (Solanaceae). *Flora Neotropica.* 84: 1--404.

Maddison, W.P. & Maddison, D.R. 2018. Mesquite: a modular system for evolutionary analysis. Version 3.51. http://www.mesquiteproject.org.

Marques, M.D.C.M. 1984. Polígalas do Brasil-III. Seção *Gymnospora* Chod. do gênero *Polygala* L. (Polygalaceae). *Rodriguésia.* 36: 31--34.

Marques, M.D.C.M. & Peixoto, A.L. 2007. Taxonomic study of *Polygala* subgenus *Ligustrina* (Chodat) Paiva (Polygalaceae). *Rodriguésia.* 58: 95--146.

Meijden, R. van der. 1982. Systematics and evolution of Xanthophyllum (Polygalaceae). *Bot. Ser.* 7:1--157.

Miller, M.A., Pfeiffer, W. & Schwartz, T. 2010. Creating the CIPRES Science Gateway for inference of large phylogenetic trees. Pp. 1–8 in: *Proceedings of the Gateway Computing Environments Workshop (GCE)*, 14 Nov 2010, New Orleans, LA. https://dx.doi.org/10.1109/GCE.2010.5676129

Paiva, J.A.R. 1998. Polygalarum Africanarum et Madagascariensium prodromus atque gerontogaei generis *Heterosamara* Kuntze, a genere *Polygala* L. segregati et a nobis denuo recepti, synopsis monographica. Fontqueria 50: 1–346.

Pastore, J.F.B. 2012. *Caamembeca:* Generic status and new name for *Polygala* subgenus *Ligustrina* (Polygalaceae). *Kew Bull.* 67: 435--442. https://dx.doi.org/10.1007/s12225-012-9360-x

Pastore, J.F.B. & Abbott, J.R. 2012. Taxonomic notes and new combinations for *Asemeia* (Polygalaceae). *Kew Bull.* 67: 801--813. https://dx.doi.org/10.1007/s12225-012-9397-x

Pastore, J.F.B., Abbott, J.R., Neubig, K.M., Whitten, W.M., Mascarenhas, R.B., Mota, M.C.A. & Berg, C.V.D. 2017. A molecular phylogeny and taxonomic notes in *Caamembeca* (Polygalaceae). *Syst. Bot.* 42: 54--62. https://dx.doi.org/10.1600/036364417X694935

Pastore, J.F.B., Cardoso, D.B.O.S. & Aymard, C.G.A. 2010. A synopsis, new combinations, and synonyms in *Acanthocladus* (Polygalaceae). *Novon* 20: 317--324. https://dx.doi.org/10.3417/2009030

Pastore, J.F.B. & Moraes, P.L.R. 2013. Generic status and lectotypifications for *Gymnospora* (Polygalaceae). *Novon* 22: 304--306. https://dx.doi.org/10.3417/2010113

Pedley, L. 1984. A revision of *Comesperma* (Polygalaceae) in Queensland. Austrobaileya. 7--14.

Persson, C. 2001. Phylogenetic relationships in Polygalaceae based on plastid DNA sequences from the *trnL-F* region. *Taxon* 50: 763--779. https://dx.doi.org/10.2307/1223706

Prado, D.E. 1991. *A critical evaluation of the floristic links between Chaco and Caatingas vegetation in South America*. Dissertation, University of Saint Andrews. Saint Andrews, Scotland, U.K.

Rambaut A., Suchard, M.A., Xie D. & Drummond, A.J. 2014. Tracer, version 1.6, University of Oxford. http://tree.bio.ed.ac.uk/software/tracer/

Rambaut, A. 2012. FigTree, version 1.4.0., University of Oxford. http://tree.bio.ed.ac.uk/software/figtree/

Ribichich, A.M. 2002. El modelo clássico de la fitogeografia de Argentina: UN análisis crítico. *Interciencia* 27: 669--675.

Ronquist, F., Teslenko, M., Mark, P. van der, Ayres, D.L., Darling, A., Höhna, S., Larget, B., Liu, L., Suchard, M.A. & Huelsenbeck, J.P. 2012. MrBayes 3.2: efficient Bayesian

phylogenetic inference and model choice across a large model space. *Syst. Biol.* 61: 539--542. https://dx.doi.org/10.1093/sysbio/sys029

Schwabe, H. 1947. Estudio anatómico de las espécies argentinas del género *Bredemeyera* (Polygaláceas). *Bol. Soc. Argent. Bot* 2: 65--72.

Sun, Y., Skinner, D.Z., Liang, G.H. & Hulbert, S.H. 1994. Phylogenetic analysis of Sorghum and related taxa using internal transcribed spacers of nuclear ribosomal DNA. *Theor. Appl. Genet.* 89: 26--32. https://dx.doi.org/10.1007/BF00226978

Swofford, D.L. 2002. PAUP*: Phylogenetic analysis using parsimony (*and other methods), version 4.0 Beta, Sunderland: Massachusetts: Sinauer.

Taberlet, P., Gielly, L., Pautou, G. & Bouvet, J. 1991. Universal primers for amplification of three non-coding regions of chloroplast DNA. *Plant Molecular Biology* 17: 1105--1109. https://dx.doi.org/10.1007/BF00037152

Tsukaya, H., Monica, S. & Hiroshi, O. 2016. A new species of *Epirixanthes* (Polygalaceaea) from Imbak Canyon, Sabah, Borneo. *Phytotaxa.* 266: 146--150.

White, T.J., Bruns, T. Lee S. & Taylor, J. 1990. Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. Pp. 315–322 in: Innis, M., Gelfand, D., Sninsky, J. & White, Y., eds., PCR *Protocols: A Guide to Methods and Applications*. San Diego: Academic Press.

Wojciechowski, M.F., Lavin, M. & Sanderson, M. 2004. A phylogeny of legumes (Leguminosae) based on analysis of the plastid *matK* gene resolves many well-supported subclades within the family. *Amer. J. Bot.* 91: 1846--1862. https://dx.doi.org/10.3732/ajb.91.11.1846

CONSIDERAÇÕES FINAIS

Após os estudos apresentados nesta dissertação conclui-se, com base em evidencias morfológicas, filogenéticas e anatômicas (baseadas em Verkerke 1985), que o gênero *Bredemeyera* deve ser delimitado excluindo as espécies *B. microphylla e B. colletioides*, que devem ser reconhecidas como *Rhamphopetalum microphyllum e Hualania colletioides* respectivamente, todas pertencentes a gêneros monotípicos. Além disso, conclui-se que *Bredemeyera*, em sua delimitação estrita como aqui adotada, possui 13 espécies, das quais, três ainda estavam inéditas (*B. atlantica* e *B. petiolata*, parte desta dissertação e já publicadas, e *B. pastoreana* Mota inéd.). Também foram propostos que: 1. B. densiflora deve ser tratado como sinônimo de *B. bracteata*, 2. *B. lucida* como sinônimo de *B. divaricata* e 3. *B. disperma* e *B. autranii* como sinônimos de *B. laurifolia*. Por fim, conclui-se que o gênero *Bredemeyera* é exclusivamente neotropical, ocorrendo desde o México até o Paraguai, mas com todas as suas espécies representadas no Brasil, onde o estado da Bahia é aquele que concentra o maior número de espécies.

REFERÊNCIAS

APG IV. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. **Botanical Journal of the Linnean Society,** v. 181: p. 1-20. 2016.

AYMARD, G. A.; BERRY, P. E.; ERIKSEN, B. Polygalaceae. In: BERRY, P. E.; YATSKIEVYCH, K.; HOLST, B. K. (Ed.) **Flora of the Venezuelan Guayana**. St. Louis: Missouri Botanical Garden Press, 2004. p. 316-347.

BACHMAN, S.; MOAT, J.; HILL, A.; DE LA TORRE, J.; SCOTT, B. Supporting Red List threat assessments with GeoCAT: Geospatial Conservation Assessment Tool. **ZooKeys,** v. 150, p. 117-126. 2011.

BENNETT, A. W. Polygaleae. In: MARTIUS, C. F. P.; EICHLER, A. W.; URBAN, I. (Ed.) **Flora Brasiliensis.** Leipzig: Friedrich Fleischer, 1874. p. 1-82

BENTHAM, G. Polygalaceae. Contributions towards a Flora of South America. Enumeration of plants collected by Mr. Schomburgk, in British Guiana. **Journal of Botany,** v. 5, p. 99-133. 1842.

BENTHAM, G. Second report on Mr. Spruce's collections of dried plants from North Brazil. **Journal of Botany and Kew Garden Miscellany,** v. 3, p. 161-166. 1851.

BFG. Growing knowledge: an overview of seed plant diversity in Brasil. **Rodriguésia,** v. 66, p. 1085-1113. 2015.

CHODAT, R. H. Monographia Polygalacearum. In_____. **Memoires de la Société de Physique et d'Histoire Naturelle de Genève.** Genebra: Imprimerie Aubert-Schuchardt, 1893. p. 1-500.

CHODAT, R. H. Polygalaceæ novæ vel parum cognitæ. **Bulletin de l'Herbier Boissier,** v. 2, p. 167-174. 1894.

CRIBB, P. J.; TOSCANO DE BRITO, A. L. V. Introduction and History. In: SPRUNGER, S.; CRIBB, P. J.; TOSCANO DE BRITO, A. L. V. (Ed.). **João Barbosa Rodrigues: Iconographie des orchidées du Brésil.** Basiléia: Friedrich Reinhardt Verlag, 1996. p 23-46.

van DAM, J. A. C. The Guyanan Plant Collections of Robert and Richard Schomburgk. In: JANSEN-JACOBS, M. J. (Ed.). **Flora of The Guianas. Supplementary Series Fascicle.** Richmond: Royal Botanic Gardens, 2002. p. 1-212.

DRYFLOR. Plant diversity patterns in neotropical dry forests and their conservation implications. **Science,** v. 353, p. 1383-1387. 2016.

ERIKSEN, B.; STAHL, B.; PERSSON, C. Polygalaceae. In: Harling, G.; Andersson, L. (Ed.). **Flora of Ecuador**. Göteborg: University of Göteborg, 2000. p. 1-132

ERIKSEN, B.; C. PERSSON. Polygalaceae. In: Kubitzki, K. (Ed.). **The families and genera of vascular plants.** Berlim: Springer-Verlag. 2007. p. 345-363

HASSKARL, I. C. Polygalaceae, praesertim indicae. **Annales Musei botanici lugduno-batavi**, v. 1, p. 142-196. 1864.

HIND, D. J. N. Catalogue of Brazilian Plants. A transcription of George Gardner's manuscript. Kew, Royal Botanic Gardens. 2012. <http://www.kew.org/science/tropamerica/gardner/Catalogue.pdf>

IBGE. *Enciclopédia dos Municípios* 6. Rio de Janeiro: Fundação Instituto Brasileiro de Geografia e Estatística. 1960.

INCT - Herbário Virtual da Flora e dos Fungos. [continuously updated]. Available from: http://inct.splink.org.br. (last accessed March 2018). 2018

IUCN - Standards and Petitions Subcommittee. Guidelines for using the IUCN Red List Categories and Criteria. Version 13. Switzerland and Cambridge, UK: IUCN. 2017

MACBRIDE J. F. Flora of Peru. **Publications of the Field Museum of Natural History,** v. 13, p. 781-999. 1950.

MARQUES, M. C. M. Revisão das espécies do gênero *Bredemeyera* Willd. (Polygalaceae) do Brasil. **Rodriguésia,** v. 32, p. 269-321. 1980.

MARQUES, M. C. M.; GOMES, K. Polygalaceae. In: WANDERLEY, M. G. L.; SHEPHERD, G. J.; GIULIETTI, A. M.; MELHEM, T. S.; BITTRICH, V.; KAMEYAMA, C. (Ed.). **Flora Fanerogâmica do Estado de São Paulo.** São Paulo: Instituto de Botânica, 2002. p. 1-386.

MEIJDEN, R. Polygalaceae. In: STEENIS, van C. G. G. J.; de WILDE, W.J.J.O. (Ed.). **Flora Malesiana.** Dordrecht: Kluwer Academic Publishers, 1988. p. 455-539.

MENCK, J. T. M. A Questão do Rio Pirara - (1829 - 1904). Brasília: Fundação Alexandre de Gusmão. 2009.

MOTA, M.; PASTORE, J. F. B. Two new species of *Bredemeyera* (Polygalaceae) from Brazil. **Phytotaxa,** v. 351, p. 171-175. 2018.

OLIVEIRA, R. G.; MAGALHÃES, M. D. G. D. Questão do Pirara: Roraima. **Textos e Debates,** v. 1, p. 103-117. 2012.

PASTORE, J. F. B. **Polygalaceae Hoffmannsegg & Link no Distrito Federal.** *Brasil*. Universidade de Brasília, Brasília, 2006.

PASTORE, J. F. B. *Bredemeyera hebeclada* a new combination in Polygalaceae. **Novon** v. 20 p. 314-316. 2010.

PASTORE, J. F. B. *Caamembeca:* Generic Status and New Name for *Polygala* subgenus *Ligustrina* (Polygalaceae). **Kew Bulletin,** v. 67, p. 435-442. 2012.

PASTORE, J. F. B.; ABBOTT, J. R. Taxonomic Notes and New Combinations for *Asemeia* (*Polygalaceae*). **Kew Bulletin,** v. 67, p. 801-813. 2012.

PASTORE, J. F. B. A Review of Vellozo's names for Polygalaceae in his Flora Fluminensis. **Phytotaxa,** v. 108, p. 41-48. 2013.

PASTORE, J. F. B.; MORAES, P. L. R. Generic status and lectotypifications for *Gymnospora* (Polygalaceae). **Novon,** v. 22, p. 304-306. 2013.

PASTORE, J. F. B. *Bredemeyera divaricata*, a new combination for the well-known Amazonian species of Polygalaceae. **Phytotaxa,** v. 175, p. 59-60. 2014a.

PASTORE, J. F. B. Saint-Hilaire's Polygalaceae. **Phytotaxa,** v. 158, p. 201-223. 2014b.

PASTORE, J. F. B.; ABBOTT, J. R.; NEUBIG, K. M.; WHITTEN, M. W.; MASCARENHAS, R. B.; MOTA, M. C. A.; van DEN BERG, C. A Molecular phylogeny and taxonomic notes in *Caamembeca* (Polygalaceae). **Systematic Botany,** v. 42, p. 54-62. 2017.

QGIS DEVELOPMENT TEAM. QGIS Geographic Information System. Open Source Geospatial Foundation Project. Available from: http://qgis.osgeo.org. 2016.

REFLORA - Herbário Virtual. [continuously updated]. Available from: http://floradobrasil.jbrj.gov.br/reflora/herbarioVirtual/ (last accessed February 2018). 2018

REVEAL, J. L. Newly required infrafamilial names mandated by changes in the Code of Nomenclature for Algae, Fungi and Plants. **Phytoneuron,** v. 33, p. 1-32. 2012.

RIVIÉRE, P. The Guiana Travels of Robert Schomburgk: 1835-1844. In:_____ **Explorations on Behalf of the Royal Geographical Society, 1835-1839**. London: Hakluyt Society, 2006. p.1- 420.

RODRÍGUEZ, R. R.; GREUTER, W. Humboldt, Willdenow, and *Polygala* (Polygalaceae). **Taxon,** v. 50, p. 1231-1247. 2001

SAINT-HILAIRE, A. F. C. P.; C. B. A. MOQUIN-TANDON. Conspectus Polygacearum Brasilie Meridionalis. **Annales De La Société Des Sciences, Belles-Lettres Et Arts D'orléans,** v. 9, p. 44-59. 1828a.

SAINT-HILAIRE, A. F. C. P. ; MOQUIN-TANDON, C. B. A. Premier Mémoire Sur La Famille Des Polygalées. **Mémoires Du Museum D'histoire Naturelle,** v. 17, p. 313-375. 1828b.

SCHOMBURGK, R. Poligalinae. In:_____. **Reisen in Britisch-Guiana in den Jahren.** Leipzig: J. J. Weber, 1849. p. 1181-1183

SILVA, C. I., ARAUJO, G.; P. E. A. M., OLIVEIRA. Distribuição vertical dos sistemas de polinização bióticos em áreas de Cerrado sentido restrito no Triângulo Mineiro, MG, Brasil. **Acta Botanica Brasilica,** v. 26, p. 748-760. 2012.

van STEENIS, C. G. G. J. Notes On *Bredemeyera* (*Comesperma*) With A New Papuan Species And The Australian Species Listed (Polygalaceae). **Plant Biology,** v. 17, p. 377-384. 1968.

THIERS, B. [continuously updated]. **Index Herbariorum: A global directory of Public Herbaria and associated staff**. New York Botanical Garden's Virtual Herbarium. Available from: http://sweetgum.nybg.org/ih/(last accessed February 2018). 2018

TURLAND, N. J.; WIERSEMA, J. H.; BARRIE, F. R.; GREUTER, W.; HAWKSWORTH, D. L.; HERENDEEN, P. S.; KNAPP, S.; KUSBER, W.-H.; LI, D.-Z.; MARHOLD, K.; MAY, T. W.; MCNEILL, J.; MONRO, A. M.; PRADO, J.; PRICE, M. J.; SMITH, G. F. International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China In:_____. **Regnum Vegetabile**. Glashütten: Koeltz Botanical Books. 2018.

WEBERLING, F. *Morphology of flowers and inflorescences.* In:_____. **Cambridge.** Cambridge University Press. 1989. p.1-348

VERKERKE, W. OVULE and seed of Polygalaceae. **Journal of the Arnold Arboretum,** v. 66, p. 353-394. 1985.

WILLDENOW, C. L. Drei Neue Pflanzen-Gattungen. **Der Gesellschaft Naturforschender Freunde zu Berlin,** v. 3, p. 403-412. 1801.